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DEPARTMENT OF COMMERCE
BUREAU OF FOREIGN AND DOMESTIC COMMERCE
E. S. CUTLER, Acting Chief

SPECIAL AGENTS SERIES—No. 146

MARKETS FOR AGRICULTURAL IMPLEMENTS AND MACHINERY IN SOUTH AFRICA

BY

JUAN HOMS

Commercial Agent

PRICE, 5 CENTS
Sold by the Superintendent of Documents, Government Printing Office
Washington, D. C.

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LETTER OF SUBMITTAL.

DEPARTMENT OF COMMERCE,
BUREAU OF FOREIGN AND DOMESTIC COMMERCE,
Washington, August 1, 1917.

SIR: There is submitted herewith a report on the markets for agricultural implements and machinery in South Africa, by Commercial Agent Juan Homs. Mr. Homs has covered with thoroughness and a clear appreciation of fundamental factors the agricultural conditions that prevail in the Union of South Africa, in Rhodesia, and in certain of the less important regions contiguous thereto. He has not confined himself to a bare statement of the elements that enter directly into the implement business. Recognizing the importance of a broad and general comprehension of the underlying circumstances that determine the extent and character of that trade, he has discussed at some length topography, climate and rainfall, soil conditions, the character of the population, the classes of labor employed, the progress made in the direction of careful and scientific methods, the activities in agricultural education, and, in the main, all those aspects of the subject that have even an indirect bearing on the market for farm equipment. The crops grown in South Africa and the means employed to produce them are considered in detail. In the sections of the monograph that relate more intimately to the opportunity for American goods it is felt that Mr. Homs's many descriptions of the machines used by South African agriculturists and his account of the methods ordinarily followed in their importation and sale will be especially helpful to the American manufacturers who desire to build up a greater trade in this very promising and imperfectly developed field.

Respectfully,

B. S. CUTLER,
Acting Chief of Bureau.

To Hon. WILLIAM C. REDFIELD,
Secretary of Commerce.

MARKETS FOR AGRICULTURAL IMPLEMENTS AND MACHINERY IN SOUTH AFRICA.

I. INTRODUCTION.

GEOGRAPHICAL POSITION AND GOVERNMENT.

The Union of South Africa is situated in the southernmost part of the African Continent. It lies between longitudes 16° 26′ and 32° 54′ E., and between latitudes 32° 10′ and 34° 51′ S. It is bounded on the west and east by the Atlantic and Indian Oceans, respectively, and on the north by Southwest Africa, Bechuanaland Protectorate, Rhodesia, and Portuguese East Africa. The length of its coast line, exclusive of minor indentations, is about 1,760 miles.

The Union of South Africa is a self-governing British dominion, formed in May, 1910, and comprising Cape, Natal, Orange Free State, and Transvaal Provinces. A governor general representing the King, with a council or ministry, administers the executive branch of the government. Legislative power is vested in a parliament, which consists of a senate and a house of assembly. The native protectorates within or adjoining the Union's boundaries are Basutoland, Bechuanaland, and Swaziland, administered as Crown colonies by the high commissioner of South Africa (which office is held by the Union's governor general) through resident commissioners. Native chiefs exercise jurisdiction according to native law in all civil actions between natives, subject to a final appeal to the resident commissioner.

AREA AND POPULATION.

The area and population of these Provinces and territories are as follows:

Divisions.	Area.	Population.			
		Europeans.[a]	Indians.	Natives, or colored.[b]	Total.
UNION OF SOUTH AFRICA.	*Sq. miles.*				
Cape Province	276,995	582,377	6,606	1,975,982	2,564,965
Transvaal Province	110,426	420,562	10,048	1,255,602	1,686,212
Natal Province	35,290	98,114	133,031	962,898	1,194,043
Orange Free State Province	50,389	175,189	106	352,879	528,174
Total	473,100	1,276,242	149,791	4,547,361	5,973,394
PROTECTORATES.					
Bechuanaland	275,000	1,692	(c)	123,658	125,350
Basutoland	10,293	1,396	(c)	403,111	404,507
Swaziland	6,536	1,083	(c)	98,876	99,959
Total	291,829	4,171	(c)	625,645	629,816
Grand total	764,929	1,280,413	149,791	5,173,006	6,603,210

[a] Includes all whites, whether born in South Africa or abroad.
[b] Includes native African races and all colored people other than Indians.
[c] Statistics showing Indian population, separate from natives, are not available.

The area, including that of Rhodesia (438,575 square miles), which is dealt with elsewhere, is about equal to that of the States lying east of the Mississippi River, with the addition of Texas, Louisiana, and Arkansas. It is nearly ten times the size of the United Kingdom. Cape Province has a greater area than the other three Provinces of the Union combined. It is two and one-half times as large as the Transvaal, nearly eight times as large as Natal, and five and one-half times as large as Orange Free State.

The country is rather sparsely populated, and the total population is less than that of Pennsylvania. The most populous centers of South Africa are the southwestern part of Cape Province, the coastal districts of eastern Cape Province contiguous to Port Elizabeth and East London, the mining areas of Johannesburg and Pretoria, the territory contiguous to Durban and Pietermaritzburg, and Basutoland. As a general rule, all the areas near the coast are fairly well populated. Bloemfontein and Kimberley have fairly large populations, but this condition is restricted to these two cities alone, the density of the adjacent territory being much less.

In the Union of South Africa there are only 12.63 persons to the square mile, and in the native protectorates (as a whole) 2.16 persons. In Basutoland the number of natives per square mile is close to 40, making it the most densely populated part of South Africa. Europeans make up less than 20 per cent of the total population, and it is estimated that 60 per cent of these are descended from the original Dutch and French settlers, of whom the former were the more numerous. The Indian population is confined chiefly to Natal. Most of the Europeans in the country, other than Dutch, are English, Jews, Germans, and Greeks. The population of the Union increased by 797,570, or 15.41 per cent, between the years 1904 and 1911, but 638,134 represented the increase in the native or colored population (including Indians) and the increase of Europeans was only 159,436.

The lack of sufficient population to develop the country along agricultural and industrial lines is one of the most serious problems confronting South Africa to-day. European immigration is opposed by one of the strongest political parties, and the natural increase is too small to permit rapid exploitation of the country's magnificent agricultural and mineral resources.

CLIMATE IN GENERAL.

The climate of South Africa is generally cooler than that usually found at a similar latitude in the Northern Hemisphere, especially when compared with the climate of Europe and America. This is chiefly due to the great extent of ocean to the south of the continent and the relatively small area of the country, which permits the prevailing summer winds from the southeast to pass directly to the land from the cold regions of the Atlantic seas. In Cape Town and along the west coast it is colder than on the east coast, because the former part of South Africa is swept by the cold Antarctic current, whereas in Durban and on the east coast the temperature is generally much higher because of its being washed by the warm Mozambique current from the Indian Ocean. Further inland the climatic conditions of the coast are largely modified by the great increase in elevation.

A far more equable temperature is experienced in the coastal districts (where the mean daily range for the year between maximum and minimum readings is only 15½° F.) than on the upper plains of the interior. At Kimberley and Bloemfontein the daily range is nearly double that figure. On the east coast, at Durban, the mean maximum for the hottest month reaches only 84.5°, and on the west coast at Cape Town 81.1°, whereas at Kimberley it is over 93°.

The mean minimums for the coldest months are 52.3° for Durban, 46° for Cape Town, and 37.6° for Kimberley. The extreme heat of the summer, however, is very severely felt along the coast, on account of the quantity of moisture contained in the atmosphere.

The extremes of shade temperature recorded are 125° F. at Tembuland, on the east coast between East London and Durban, and 60° F. at Palmietfontein, in the northeast of Cape Province at an altitude of 4,500 feet. In Graaf Reinet, on one day in the summer of 1916, the thermometer registered 109° in the shade. In some cases pears were literally baked on the trees and a number of fowls died from the intense heat.

The air is very dry on the highlands, and the heat, therefore, is not so oppressive. The warmer parts of South Africa have a climate very similar to that of Louisiana. Frosts of sufficient severity to freeze standing water are practically unknown along the coast, but in the interior they occur somewhat frequently, more especially from May to the middle of September. Snow is of infrequent occurrence and is usually confined to the mountainous districts. On the flats along the coast it is very rarely met, and its infrequency over the highlands is indicated by the fact that in only 11 out of 57 years has it been recorded in the Transvaal Province.

One of the disagreeable features in the climate of the Union is the liability of the interior to long periods of drought when the spring rains fail. Such a drought may be intensified by a deficiency in the rainfall of the preceding autumn. The drought prevailing during the years 1915 and 1916 in the northern and midland districts of Cape Province was really the most severe experienced in the country since 1881. The land in those regions was black with drought; the soil was laid completely bare and millions of sheep and cattle perished.

Another undesirable feature of the climate of South Africa is hail. The worst hailstorms usually fall in the months of November and December. On December 16, 1909, hailstones weighing 4½ ounces were reported from Germiston, and considerable damage was done to crops in the districts of Bethal, Ermelo, Standerton, and others in the Transvaal Province. It is a fortunate fact, however, that South African hailstorms are usually confined to a comparatively narrow strip, so that not all of any farm is damaged, and as a rule the same farm is rarely visited by hail two years in succession. There are, however, "hail belts" in which these hailstorms appear to recur almost yearly.

Records of the sunshine for nine complete seasons have been obtained at the observatory in Johannesburg. The data thus compiled show that South Africa is the sunniest region in the world. In Europe the annual hours of sunshine are at a minimum in the north of Scotland, with 1,150 hours, and at a maximum in Madrid, with

2,099 hours. In Johannesburg the average for nine seasons is 3,205. The number of days without sunshine in Johannesburg averages about three in a year. Sunstroke, in spite of this, is practically unknown in South Africa, and the farmer can work out of doors without inconvenience all the year round.

The following table shows the shade temperatures prevailing in various parts of South Africa during the middle of summer and winter (January and July, respectively):

Places.	Distance from coast.	Altitude.	January.				July.			
			Mean maximum.	Mean minimum.	Absolute maximum.	Absolute minimum.	Mean maximum.	Mean minimum.	Absolute maximum.	Absolute minimum.
	Miles.	*Feet.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*
Cape Town	2	40	81.1	60.1	101.8	51	62.1	46	73.3	35.8
Port Elizabeth	.....	181	75.7	63.9	86.8	56.4	66.5	48.7	78.3	41.5
Graaf Reinet	123	2,463	87.8	58.1	101.2	46	67	36.9	77.3	25.5
Grahamstown	27	1,769	79.2	57	101	50.4	63.1	44.3	74.9	36
Queenstown	105	3,544	83.2	58.1	99.6	46.8	64	36	73	22.8
Kimberley	340	4,012	93.2	62.9	102	56.1	66.4	37.6	75.5	27.6
Bloemfontein	290	4,568	86.6	59	94.7	49.9	64.4	29.2	72.5	20.7
Pietermaritzburg	41	2,218	.....	.....	91	56	.....	.....	78.2	33.7
Durban	.....	260	84.5	68.2	89.3	62.5	74.9	52.3	83.5	42.3

SEASONS AND TIME.

It must be carefully borne in mind that the seasons in the Southern Hemisphere are the reverse of those in the northern latitudes. Spring in South Africa occurs from September to November, summer from December to February, autumn from March to May, and winter from June to August.

Noon in South Africa corresponds to 5.04 a. m. in New York.

TOPOGRAPHY.

There are practically four elevated plateaus in South Africa—the Coast Plateau, with an average elevation of 500 to 600 feet, varying in width from 50 miles in Southwest Africa to 3 miles, or even less, in the southeast of Cape Province; the Southern Karroo, a narrow strip of from 15 to 20 miles, with an altitude of about 1,500 feet; the Central Karroo, at a height of from 2,000 to 3,000 feet; and the Northern Karroo, at 4,000 feet, rising to 6,000 feet in the east. The plateaus are separated by steep escarpments, rising to a considerable height above them and rendering their modifying influence on the climate very potent. Detailed topographical information is given elsewhere in this report, where the climatic aspects of the various Provinces of the Union are reviewed.

DESCRIPTION OF CAPE PROVINCE.

The Coast Plateau forms the first of the four steps which, in general, characterize the topography of South Africa and of the Cape Province in particular. It is of an irregular width, varying from a few miles to 50 and rising from sea level to an altitude of some 600 feet. The chief characteristics of this Coast Plateau are warmth and

moisture. The average rainfall on the whole of the districts near Cape Town is 40 inches, but it varies very considerably in places only a few miles distant; thus, the rainfall at Bishopscourt averages 54.63 inches, and at the Town Hall, Cape Town, 5 miles away, 25.43 inches per annum. Immediately east of Cape Town, and as far as the district of Knysna, east of George, there is a decrease of rainfall to from 15 to 20 inches. The rainfall around Knysna and George becomes more abundant, the average being 40 inches. This well-watered strip, which is only a few miles in width, extends to within a few miles of Port Elizabeth, in which city the rainfall is only 21 inches.

The distribution of the rainfall varies considerably in different seasons, but the greater part of the coast line of Cape Province receives its rains during the winter months, from April to September. This is particularly the case in the western districts. The coast lands east of Port Elizabeth, however, differ in that respect. With Pondoland, Natal, and other parts of South Africa, they obtain most rain in the summer; that is to say, during the same period in which the greatest rainfall is expected in Kimberley and in the Transvaal and Orange Free State Provinces, where the winters, as a rule, are bright and clear. The three hottest months are January, February, and March, which are the driest around Cape Town, Ceres, and adjoining districts.

The principal towns on the Coast Plateau are: By the sea—Cape Town, Mossel Bay, George, Port Elizabeth, Port Alfred, and East London. Inland—Malmesbury, 352 feet; Wellington, 384 feet; Paarl, 405 feet; Stellenbosch, 364 feet; Caledon, 800 feet; Swellendam, 500 feet; Riversdale, 200 feet; George, 620 feet; Humansdorp, 502 feet; and Uitenhage, 169 feet.

The word "Karroo" occurs frequently in anything connected with the Union of South Africa. This name is locally applied to the land occupied by Cape Province with the exception of the Coast Plateau and the uplands along its eastern extremity. It is distinguished as Southern, Central, and Northern Karroo, according to situation. The areas of the Karroo are characterized by the existence of an aromatic little grey shrub, which stands 8 to 10 inches high, with roots penetrating several feet below the surface. This shrub (or bush, as it is more often called) constitutes the chief value of this extensive area of land, except where irrigation is resorted to.

In appearance this bush is an unpromising-looking vegetable, but it provides sustenance for millions of sheep and goats even in the driest seasons, although it may be burnt by the sun into little more than a dry bunch of twigs; and, provided the water in the farmers' dams holds out, the flocks and herds can obtain sufficient nourishment from the bushes at all times. When the spring rains come these bushes respond more quickly to the influence of the moisture than perhaps any other class of vegetation. What before the rains were immense waste lands, with hardly any vegetable life upon them, burst out even in the most desert-like parts of the Karroo into endless stretches of green bushes, every weed and bush throwing up its spike of flowers and struggling hard, during the short time permitted, to blossom and mature its seed. Few deserts have a more desolate appearance than the Karroo districts in summer. Verdure is entirely lacking, the numerous water gullies are nearly always dry,

and the low ranges of ironstone seem to reflect the heat as from a mirror. The Karroo has one of the most fruitful soils in the world, and only needs water to carry the heaviest crops of grass, wheat, or fruit. Where the land is irrigated it is possible to step across a low fence and have one foot in a parched desert, where the sand blisters the skin, and the other in an orchard, where the peach trees are breaking down with fruit and the maize flowers are rustling in the wind 12 feet above the ground.

The Southern Karroo is situated north of the Coast Plateau. From the Coast Plateau the ground rises more or less abruptly in the second plateau formed by the Southern Karroo.

To the west the rise is gradual through the fertile Goudini Valley, where Worcester (794 feet) and Robertson (700 feet) are situated. Farther east in the Oudtshoorn Valley and on the many hills to the east, the vegetation and climate partake more of the arid Karroo character. The towns of this second plateau are Montagu (750 feet), Ladismith (1,860 feet), Oudtshoorn (1,014 feet), and Uniondale (2,200 feet). In comparing the Southern Karroo climate with that of the Coast Plateau a very great change is noticeable. The rainfall, except on the mountain slopes, is much smaller and the range of temperature is somewhat greater.

The Great, or Central, Karroo, extending east and west for a distance of about 350 miles, at an elevation of from 2,000 to 3,000 feet above the sea, is said to exceed 100,000 square miles in extent—that is, more than one-third the total area of Cape Province. This elevation forms the third of the four steps mentioned.

The winters are bright and clear, the nights cold, with the thermometer below the freezing point. The mountain tops are often covered with snow, which, however, never lies long on the plain itself. The mean daily range of temperature is very great—about 27° F. The hottest month is January, with a mean maximum of 87° F., and the coldest is July, with a mean minimum of 36° F.

The summer heat is not so oppressive as it would be if the air were not so intensely dry. The rainfall is scanty, and it occurs principally in the summer. Westward of Beaufort West, however, the country can be said to lie within the zone of the winter rains. The average annual rainfall in the Central Karroo is about 10 inches in the west, increasing to 18 inches in the east.

The principal towns in this section are Prince Albert (2,120 feet), Beaufort West (2,792 feet), Aberdeen (2,850 feet), Willowmore (2,769 feet), Graaf Reinet (2,463 feet), Somerset East (2,304 feet), and Cradock (2,956 feet).

The fourth step in the topography of the Cape Province is formed by the Northern Plateau, or Karroo, stretching northward to the Orange River, still farther inland and at an elevation of from 2,800 to 6,000 feet above sea level. The Orange River itself is merely a political boundary.

The climate of the interior plains of South Africa, when the altitude of 4,000 feet is reached, is remarkably uniform. It can not be said that in this section of the Cape Province there is any marked division of the year into spring, summer, autumn, and winter; rather it may be described as a long summer and a long winter. The former begins rather suddenly—about September—increases until January, and then decreases until the end of April, while the latter may be

said to last from the end of April until September. This plateau is exceedingly dry, some parts in the west averaging as little as 2 inches of rain in the year, the average for the whole of this plateau being 10 inches, of which in the west the greater part falls in violent summer thunderstorms. Unfortunately only a small portion of this amount of rainfall, slight as it is, is available for agricultural purposes, the greater part running off the sun-baked soil into the deep gullies, which hurry off the much-needed water to the sea. Boring experiments, however, have proved that considerable quantities of water exist at small depths below the surface.

In the western districts agriculture on a limited scale only is pursued in the neighborhood of the villages, the chief industry being cattle and sheep. Twenty acres of land are required to support a sheep, but with irrigation 246 bushels of wheat have been harvested from 1 bushel of seed.

The eastern portions of this plateau are the best watered, the rainfall increasing to 18 inches. They are also the most verdant and the least destitute of larger vegetation. The towns in this region are Tarkastad, lying in open ground, with a rainfall of 18 inches; Middleburg, Aliwal North, Burghersdorp, Dordrecht, and Barkly East (5,831 feet), the last-named being the highest town in Cape Colony.

The central portion of this plateau includes the towns of Hanover (4,400 feet), Colesberg (4,373 feet), Richmond (4,500 feet), Victoria West (4,614 feet), and Carnarvon (4,111 feet).

The neighborhood of these central towns partakes chiefly of the arid Karroo character, the rainfall being less than in the eastern districts, although in other respects the climate is similar.

The country toward Kimberley is practically a continuation of the northern plateaus of the Cape Province. In the extreme east of Cape Province, from Port Elizabeth to the Natal border, behind the Coast Plateau, which extends over the entire seacoast of South Africa, is what is called the Eastern Plateau.

This can be designated as the hinterland of East London and partly that of Port Elizabeth. The climate is fairly equable and the rainfall 30 inches, which is more distributed throughout the entire 12 months of the year than is the case elsewhere in South Africa. The towns in this section are Fort Beaufort (1,395 feet), Alice (1,720 feet), Grahamstown (1,769 feet), King Williams Town (1,275 feet), and Bedford (1,275 feet). Many of these are pleasantly situated in hilly country, plentifully watered and interspersed with stretches of forest. Higher, on what may be described as the upper edge of the Eastern Plateau, is Queenstown (3,544 feet), a fine, healthful, and important agricultural center.

East of the portion of the Cape Province just described is situated what at times is called Kaffraria and at others the Transkei Territories. An increase in humidity is noted here and the country partakes more of the general climate of Natal, as also in respect to rainfall, which is greater than anywhere in the Cape Province, except at the southwest corner of that Province contiguous to Cape Town.

AGRICULTURAL, PASTORAL, AND MINERAL RESOURCES.

The Cape Province is very rich in farming land, and ranks first among the four Provinces in the growing of wheat, oats, hay, bar-

ley, rye, peas, beans, and potatoes. Tobacco, alfalfa, grapes, and fruits are other important products.

One of the most valuable industries of the Province is the raising of ostriches, the feathers from which have constituted one of the principal exports of the country. This industry flourishes best in the southern part of the Province, between Cape Town and Port Elizabeth, with Oudtshoorn as the chief center. Prior to the depression suffered by the industry during the past three years, ostrich farming was being extended to many other parts of Cape Province. South Africa supplies about 85 per cent of the world's ostrich-feather requirements. Stock raising is engaged in extensively in every district of this Province, sheep growing being the most important branch of the industry. The raising of angora goats is closely confined to its eastern districts. Of 16,306,203 pounds of mohair shipped from the Union in 1915, 13,352,046 pounds were shipped from Port Elizabeth and 1,985,374 pounds from East London.

The products of the land of Cape Province are as follows: Southwest—Wool, hides and skins, wheat, oats, barley, fruit, wine, and tobacco. Northwest—Wool, hides and skins, wheat, and other small cereals. North (toward Kimberley)—Wool, alfalfa, horses, mohair. Central (near the coast)—Tobacco, ostrich feathers, fruit, alfalfa, maize, wheat. Southeast—Maize, wheat, fruit, feathers, alfalfa, wool and mohair, cattle, and dairy products. Northeast—Maize, wheat, cattle, wool, mohair, hides and skins, alfalfa, and dairy products.

Cape Province ranks second among the Provinces of the Union in the output of mineral products. This is largely due to the fact that Kimberley, with its famous diamond mines, is situated within its boundaries. In the production of copper it holds first rank, with Transvaal Province a close rival. Asbestos is found in various parts of this Province. The total production of the mines is under $20,000,000, approximately, per annum.

Cape Province looks primarily to its pastoral and agricultural resources for its support and future development, and, with irrigation and closer settlement, which are increasingly resorted to, the production of its soil can be enormously increased.

PRINCIPAL CITIES.

CAPE TOWN.

Cape Town, with a population of 146,000, is the largest city in the Province and is the legislative capital of the Union. The trade of this port, according to the official trade returns, ranked second in 1915, with total imports and exports amounting to $61,018,946, as compared with $77,491,849 for Durban. If the figures of the gold exports, which are at present kept from the public, were included, they would probably give Cape Town the first place among South African ports in the value of its trade, inasmuch as the bulk of the gold shipments of the Transvaal are made through Cape Town.

In 1915, 1,210 vessels entered the port and discharged 702,305 tons of cargo, and 1,219 vessels cleared with 421,792 tons of cargo. There is a splendid harbor at Cape Town, and a breakwater 3,640 feet long

provides safe anchorage in the bay. Good coaling and crainage facilities are provided.

The city itself is beautifully situated on the bay, with Table Mountain, over 3,500 feet high, in the background. The attractive surroundings and excellent climate make it one of the finest residential cities of South Africa. The population is about equally divided between Europeans, or whites, and natives, or mixed colored. A remarkable development in Cape Town in recent years has been the opening up of the outskirts by electric street cars and railways, all the coaches being of American manufacture. The city is the distributing center for a large volume of trade from the eastern and northern sections of the Province and is the terminus of the railway lines from Rhodesia, Transvaal, Orange Free State, and Natal. With the exception of gold and diamonds, however, most of the exports from the other Provinces of the Union are shipped from Durban, in Natal, and East London and Port Elizabeth, in Cape Province.

American manufacturers of agricultural machinery, generally speaking, have in the past found Cape Town the most difficult city in South Africa in which to establish business relations. It holds undisputed first rank among the farm-machinery selling centers of South Africa in the volume of business in harvesting machinery, because of the fact that the principal wheat-growing districts of the Union are contiguous to Cape Town, and it is admitted that the United States supplies at least 75 per cent of the trade in that class of goods. Outside of harvesting machinery, and particularly in connection with plows, the trade has long been accustomed to certain lines made in England and Germany, and until recently it has been impossible for American manufacturers to win a fair share of that trade. Before the war 75 per cent of the implements sold by Germany to South Africa were purchased by Cape Town merchants.

PORT ELIZABETH.

Port Elizabeth, 428 miles by sea from Cape Town, is the second port of importance (known as Algoa Bay) in Cape Province. It has a population of 30,676, of whom 18,216 are white. There is no quay or pier, and vessels anchor in the bay; cargo and passengers are embarked and disembarked by means of tugs and lighters, which are controlled by the Government. There are no harbor or light dues. The charges for landing cargo at the jetty vary from 1s. 6d. (36.5 cents) to 4s. (97.3 cents) per ton. The terminal facilities permit the loading of goods in transit directly to the railway cars. Port Elizabeth has excellent railway connections with Orange Free State and Transvaal Provinces, and the heavy carrying trade has contributed largely to its commercial importance. It is also a large distributing center for the eastern parts of Cape Province, Basutoland, and Orange Free State.

Port Elizabeth is perhaps most noted as the largest ostrich-feather market in the world. Feathers are collected from all the surrounding districts and brought to Port Elizabeth, where they are sold on the public market by auction, the sales taking place, in ordinary times,

on every Monday, Tuesday, and Wednesday. Since the beginning of the war ostrich-feather sales are held less frequently. Large shipments of wool, mohair, and hides and skins also leave Port Elizabeth.

The total cargo landed at Port Elizabeth during 1915 amounted to 260,859 tons, and the shipments were 113,507 tons. There has been a decided falling off in the volume of trade handled by this port, owing to the difficulties experienced by the ostrich-feather farmers and nearly three continuous years of very severe drought in many parts of its hinterland. In 1912 the cargo landed amounted to 507,263 tons and the shipments to 128,512 tons. Vessels to the number of 368 entered and cleared the port during 1915.

Port Elizabeth ranked fourth in 1915 among the trade centers of the Union in the value of its importations of agricultural machinery and implements, the amount being $210,432.[a] From the viewpoint of the American manufacturer, however (with the exception of harvesting machinery), it is conceded to have more importance than Cape Town as a purchaser of this class of goods.

While the farming districts around Port Elizabeth have kept pace with the most progressive districts of South Africa as regards agricultural development, many parts of its vast hinterland have had to contend with conditions retarding their progress in that direction. Chief among these are the droughts that have prevailed for the last five years and the comparatively easy profits to be obtained from wool growing and ostrich farming. Since the depreciation in the value of ostrich feathers diversified farming has received a marked impetus, and a distinct improvement in the situation will most probably be noted in the next few years.

Irrigation works and closer settlement are much talked about, and several important schemes along these lines are being vigorously prosecuted. The chief reason why Port Elizabeth is looked upon as a more promising market for American farm machinery than Cape Town is that its merchants send their travelers through a much wider territory, which includes the northwest of Cape Province, the Orange Free State, the Transvaal, and Rhodesia.

EAST LONDON.

East London, 131 miles northeast of Port Elizabeth, is another port in Cape Province that is rapidly increasing in importance, owing not only to the large transit trade it handles but also to the fact that it is the port of a rich hinterland, including the Transkei Territories, with their many thousands of square miles of fertile, well-watered soil and ample population. Stock raising is an important industry, and some of the districts are far-famed as most excellently suited for the production of good breeding stock. The exports of wool from this port in 1915 (64,109,810 pounds) exceeded those of any other South African port, and this position has been maintained for several years. Hides and skins and mohair are also important items of trade.

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[a] EDITOR'S NOTE.—According to a report by Consul E. A. Wakefield, received as this monograph was going to press, the imports at Port Elizabeth under the single heading of "Agricultural implements" amounted to $345,380 in 1916 as against $59,135 in the preceding year. These figures apparently do not cover certain articles of machinery included by Commercial Agent Homs.

East London has an advantage over Port Elizabeth in possessing a fairly good harbor, with wharves and docking facilities. During 1915, 381 vessels entered the port, discharging 195,340 tons of cargo, and 379 vessels cleared with 154,564 tons.

The town is well situated on the eastern bank of the Buffalo River, which enters the sea at this point. The population in 1911 was 21,277, of whom 12,552 were white.

While according to statistics East London ranks third among the South African ports as regards the volume of its importations of agricultural machinery and implements—$277,750 in 1915 [a]—it is undoubtedly of greater importance to our manufacturers of this class of goods, except those of harvesting machinery, than Cape Town. What for some years has been considered the largest firm importing American farm tools has its head office in this city.

MOSSEL BAY.

Mossel Bay is the only other port in Cape Province that is a port of call for mail steamers. It lies between Cape Town and Port Elizabeth, 242 miles by sea from the former and 186 miles from the latter. In August, 1913, it was connected by rail with Port Elizabeth and with Oudtshoorn, and as the latter is one of the best agricultural and ostrich-producing districts of the Union, Mossel Bay is likely in time to become an important port and to handle part of the trade that formerly went to Port Elizabeth. There is also railway connection with Cape Town, the distance being 318 miles. The town is small, having a population of 4,206, of whom about 40 per cent are white.

INTERIOR TOWNS.

Oudtshoorn is generally considered the most important interior town of Cape Province. It has a population of 12,000, 75 per cent being white (mainly Dutch). The highest prices obtained for South African agricultural land were paid in this district, as much as $3,350 per morgen (2.11 acres) being paid for a small parcel of irrigated land in the neighborhood of this town.

Other interior centers of trade are Grahamstown, King Williams Town, Cradock, Graaf Reinet, Queenstown, and Uitenhage, in the east; Calvinia, Carnarvon, Malmesbury, and Piquetberg, in the west; and Worcester in the south, 109 miles from Cape Town. Kimberley, in the north, is famous for the richest diamond mines in the world. The total output of diamonds from Cape Province in 1913 was 2,461,535 carats, valued at $34,043,291.

THE TRANSKEIAN TERRITORIES.

The Transkeian Territories, which are often designated under the name of Kaffraria, comprise the native territories of Griqualand East, Tembuland, and Pondoland, which were finally annexed by

[a] EDITOR'S NOTE.—According to a report by Consul E. A. Wakefield, received as this monograph was going to press, the imports at East London under the single heading of "Agricultural implements" amounted to $439,158 in 1916 as against $231,203 in the preceding year. These figures apparently do not cover certain articles of machinery included by Commercial Agent Homs.

the Cape Colony in 1894. They cover an area of about 22,000 square miles, with a population of 16,777 whites and 817,867 natives, and are situated in the extreme east of Cape Province, contiguous to the Natal border.

Griqualand East lies at an altitude of about 4,000 feet and is eminently suited for European occupation. Pondoland is a low country and, being warmer, is preferred by the natives. The soil being fertile and the rainfall generous, Griqualand East produces large crops of cereals and other products and feeds large quantities of stock. There are numerous first-class mixed farms owned by progressive British farmers in the districts of Mount Currie, Matatiele, Mount Fletcher, Maclear, and Umzimkulu. The land elsewhere is generally held by the natives on the communistic principle, but their custom of heaping up all their wealth in the shape of cattle has led to the overstocking of their lands, raising a problem difficult of solution.

These territories are recognized as among the best in South Africa for general agriculture, and as the construction of railways proceeds and fencing is more generally adopted there is no doubt that the great natural resources of the country will rapidly develop.

The railway from Natal at present reaches the town of Franklin, and that from the Cape the town of Maclear. The 143 miles of line still to be constructed between these two towns will be completed shortly. More intense cultivation of the land is practiced by the European farmers of these territories than is the case elsewhere in South Africa, and the subdivision of farms is rapidly adding to the value of the land. The stock during the winter is fed with the crops grown in the summer, and some of the best beef and mutton in South Africa are produced. There are no fewer than 17 cheese factories, which for the past two years have hardly been able to supply the demands made upon them. The district of Matatiele alone is said to send from 5,000 to 10,000 head of cattle to Durban every year. There are immense irrigation possibilities in certain of the rivers, and thousands of acres of rich land could be brought under irrigation. Labor is cheap as compared with other parts of South Africa, $3.75 to $5 per month and maize meal being the average pay for natives. Profitable land is said to be still obtainable at $7.50 to $10 per acre.

DESCRIPTION OF NATAL.

The climate of Natal is very similar to that of the eastern districts of Cape Province, but the coast lands are decidedly warmer. The rainfall at Durban averages 39 inches and at Pietermaritzburg 38 inches, the greatest part of which falls during the summer. The rainfall during May, June, and July is very small.

The ground rises rapidly from the sea in a succession of hills and ridges, in the valleys of which tropical produce, chiefly sugar, is successfully grown. Pietermaritzburg, only 40 miles distant from the sea, lies at an altitude of 2,218 feet. North and west of that city the country is still broken in hills and valleys. The temperature falls as one approaches the heights, and where the country is level or inclosed the heat would be oppressive were it not for the tempering influence of sudden thunderstorms which are very frequent in Natal during the summer. For periods of several weeks in certain districts these

storms occur daily, almost without interruption, about the same time in the afternoon.

Zululand, which was incorporated with Natal in 1897, has the climate of a healthful subtropical country. The higher part of the country lies at an elevation of about 2,000 feet and is very productive. It is well watered and, in most respects, similar to the best districts of Natal itself. Sugar-cane cultivation has become a very remunerative industry, the country being better adapted for that crop, in the opinion of many, than most sections of Natal, where it is grown.

Natal is the most densely populated Province of the Union, having 33.83 inhabitants to the square mile. In area it is the smallest of the four Provinces. It is also one of the richest Provinces of the Union from an agricultural standpoint, the production of sugar, which in 1915 exceeded 110,000 tons, aiding it to hold that position. The climate is more tropical than that of the Cape Province. Dairying has perhaps made more progress in Natal than in any of the other Provinces. Maize is also grown on a large scale, and Natal, in pre-Union days, initiated, and for several years led in, the exportation of this cereal to foreign countries. Wheat, oats, and the other small cereals are not grown to any great extent. The climate and the pastures of many districts are exceptionally well adapted for stock raising, but the ravages of the East Coast fever have in the past interfered with the greater expansion of that industry. Wattle bark is grown extensively, that being a product almost entirely confined to this Province and the extreme northeastern districts of Cape Province. Coal in great abundance is found in various parts of Natal, and this industry has already attained considerable importance. No other mineral is mined in Natal at present. The whaling industry is also of importance, the annual average catch being at the rate of 1,000 whales.

There are numerous smaller industries in Natal, such as breweries, wagon and carriage works, asbestos manufacturing, wicker and wooden furniture, boots, shoes, and confectionery. In the establishment of these industries Natal has shown greater enterprise than the other Provinces of the Union.

Along the coast of Natal and Zululand the chief crops under cultivation are sugar, tea, wattle bark, and tropical fruits; farther inland, maize, wattle bark, and alfalfa. Experiments carried out in Zululand have proved that areas of that territory are suitable for the cultivation of cotton.

PRINCIPAL CITIES.

Durban, which port is known as Port Natal and is the only one in the Province at which larger vessels call, is the chief city of Natal. It is 812 miles from Cape Town, 384 from Port Elizabeth, 253 from East London, and 295 from Lourenço Marques, in Portuguese East Africa. A system of railways connects Durban with the principal cities of the Transvaal and Orange Free State, for which it is the chief port. At present it is likely that 50 per cent of the total imports into the Transvaal enter via Durban.

During 1915, 988 vessels entered Durban and discharged 680,364 tons of cargo, and 980 steamers cleared with 1,608,523 tons of cargo—a far greater tonnage of exports than that handled by all the other South African ports combined, the share of the total being nearly 69

per cent. The port derives additional importance from the fact that it is the terminus of several lines of vessels trading between South Africa and India, as well as for the steamers plying along the East Coast of Africa, and is a port of call for several lines from England to Australia.

Durban has an excellent, well-sheltered harbor, with a narrow entrance, and a breakwater extending more than 2,000 feet into the sea. The inner basin covers about 7½ square miles and is provided with 12,800 feet of wharves and quayage. The wharves are equipped with sheds of a total capacity of 100,000 tons, coaling appliances capable of loading 400 tons an hour, and 50 hydraulic, steam, and electric cranes of various capacities up to 50 tons.

The town itself and its suburbs are among the most beautiful in South Africa and particularly pleasant to live in, except during the summer months—October to March—when the climate is very hot. The total population is 72,512, of whom 33,271 are European, 18,662 natives, and 20,579 Asiatics and other colored persons, chiefly Indians.

The imports of agricultural machinery and implements through the port of Durban in 1915 were valued at $712,855, more than twice the value imported through any other South African port.[a] Apart from the undoubted importance of Durban as the chief distributing center for these goods, the fact must also be considered that a large percentage of the farm machinery imported by Johannesburg firms passes through this port, which indicates the nearness of Durban to the principal farm-machinery consuming markets of South Africa. Its desirability as a city in which to establish the headquarters for resident representatives of American manufacturers of farm machinery is therefore readily apparent. All the chief agricultural-machinery trading centers of South Africa, except Cape Town, can be reached from Durban by either steamer or rail in about 24 hours, and the rich agricultural districts of the eastern Transvaal and Orange Free State are within even easier access from that city. The only argument sometimes advanced against Durban as the South African headquarters for representatives of firms overseas is that foreign mails arrive two days later than in Cape Town and they have also to be mailed two days before this need be done in the latter city. In every other respect Durban is widely recognized as the most suitable, as well as the most economical, headquarters for those who must keep in touch with the firms purchasing agricultural machinery, and its handicap as regards mail facilities is more than offset by its many other advantages.

Pietermaritzburg, 71 miles west of Durban on the main line of the railway to the Orange Free State and Transvaal, is the capital of Natal and the only other city of importance in the Province. It is situated in the highlands 2,218 feet above the sea and has a population of 30,000, of whom about half are Europeans. Newcastle, Ladysmith, and Vryheid are other trading centers of minor importance.

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[a] EDITOR'S NOTE.—According to a report by Consul William W. Masterson, received as this monograph was going to press, the imports at Durban under the single heading of "Agricultural implements" amounted to $1,067,413 in 1916 as against $628,663 in the preceding year. These figures apparently do not cover certain articles of machinery included by Commercial Agent Homs. They show an important increase in the purchases of farming implements.

DESCRIPTION OF ORANGE FREE STATE.

Orange Free State Province lies in a broad plateau, 4,000 to 5,000 feet above sea level. This great plateau, more than 50,000 square miles in extent, is almost destitute of trees. The rainfall is moderate, averaging probably 22 inches per annum, the eastern districts being the best watered. The precipitation occurs chiefly during the winter months, in the shape of violent thunderstorms. Most of the water is rapidly carried away by the deep-cut river beds, which are generally 30 to 40 feet below the level of the surrounding country and speedily drain all moisture from their vicinity.

The Orange Free State, according to the 1911 census, has a larger area under crops (5.73 per cent of the total) than any of the other Provinces of the Union, is the smallest in population. next to the smallest in area, and entirely shut in from the sea. Durban, East London, and Port Elizabeth are the chief ports serving this Province. The eastern districts are the best for mixed farming, maize and wheat (chiefly the former) being grown extensively; maize is also the crop chiefly cultivated in the other farming districts of the Province. The farms are mainly in the hands of the Dutch. Stock farming is an important industry, the Orange Free State ranking next to Cape Province in the production of wool, mohair, and hides and skins. Some of the districts west of Bloemfontein are famous as among the best in the Union for the breeding of horses. Diamond and coal mines are worked in various parts of this Province, but the total mineral production in 1914 did not exceed $5,000,000.

Bloemfontein, situated near the center of the Orange Free State, is the capital city and the chief commercial center of that Province. It has a population of 27,000, about evenly divided between Europeans and natives. Other towns of minor importance are Kroonstad, Ladybrand, and Harrismith.

DESCRIPTION OF TRANSVAAL.

The Transvaal Province lies to the north of the Orange Free State, between the Vaal and Limpopo Rivers. The altitude reaches 6,000 feet around Johannesburg, decreasing in every direction as that city is left behind. The entire Transvaal Province, however, lies at high altitudes, ranging from 4,000 to 6,000 feet. South of Johannesburg there is an extensive flat, surpassing even that of Orange Free State in extent. In the uplands bitter cold is felt during the winter, when snow occasionally falls, frosty nights being experienced during a considerable part of the winter. During the summer the heat is sometimes great. The eastern Transvaal is well watered, the rainfall being from 25 to 35 inches. Toward the west it ranges from 10 to 25 inches. The rainfall is chiefly obtained in two seasons, one lasting over October, November, and part of December, and the other beginning the middle of February and lasting until April.

The presence of rich mineral deposits within its borders makes this by far the wealthiest Province of the Union. The gold production of the Transvaal in 1914 amounted to $173,523,885. The Premier diamond mine is situated in this Province, and coal mining is also en-

gaged in extensively. While no recent statistics are available, it is admitted that the agricultural progress of the Transvaal is carried on at a faster pace than is the case in any of the other three Provinces of the Union. Its southern and eastern districts, adjoining Natal and Orange Free State Provinces, are very rich in agricultural resources. The Transvaal already ranks first in the production of maize and second in the production of wheat, barley, and Kafir corn. Tobacco is grown more extensively there than elsewhere in South Africa. Fruit growing (principally citrus fruits) is an important industry, and the output is of excellent quality. Great hopes are entertained as to the suitability of certain districts of the Transvaal for the cultivation of cotton, and a great deal of success has already been attained in the cultivation of this crop in the Rustenburg district. In northern Transvaal in particular, as well as throughout this Province, stock raising is engaged in extensively. There are 11,679 registered farms in the Transvaal, of which about one-half are occupied.

PRINCIPAL CITIES.

Johannesburg, in the center of the gold fields, is the largest city of the Union, and is generally conceded to be the commercial capital of British South Africa. It is spread over an area of 80 square miles and has a population of 253,510, of whom 134,000 are Europeans, or whites—this figure representing about four times the white population of the next largest city in South Africa. The distance to Cape Town is approximately 1,000 miles, to Port Elizabeth 712 miles, to East London 665 miles, to Durban 482 miles, to Delagoa Bay, in Portuguese East Africa, 394 miles, to Bulawayo, in Rhodesia, 680 miles.

The city is built much on the lines of a modern European city, with broad streets, numerous six to eight story office buildings, shops and apartment houses, excellent hotels, and fine residences in the suburbs. Nearly 60 miles of street tramway lines are used. Its rapid growth in the last 20 years, before which time it was little more than a mining camp, has been marvelous. All the principal importing firms in South Africa maintain large establishments, with huge stocks, in Johannesburg, and it is not only the center of a considerable trade in mining machinery and supplies, but also a distributing point for the supply of agricultural requirements for the whole of the Province, as also for the north, including Rhodesia. It is also an important railway center, from which lines radiate to all parts of the Union and to Rhodesia. It is said that the cost of necessary commodities in Johannesburg is from 25 to 150 per cent higher than in the provincial capitals of Europe, and from 25 to 50 per cent higher than the average in the United States. The bulk of the export trade of Johannesburg and western Transvaal (with the exception of minerals) passed through the port of Lourenço Marques, in Portuguese East Africa, before the war, but this trade has been largely diverted to Durban since the beginning of hostilities, despite the fact that Lourenço Marques is 88 miles nearer to Johannesburg than Durban.

Pretoria, 45 miles northeast of Johannesburg, is the administrative capital of South Africa, and has a population of 48,609, of whom the

greater number are Europeans. It is situated in a valley nearly 5,000 feet above sea level and surrounded by a small range of mountains. Some very rich farming land is to be found in the environs, giving the town considerable commercial importance. The Premier diamond mine is only 22 miles from Pretoria.

There are numerous smaller towns and trading centers in the Transvaal, of which Germiston (population 54,000), Krugersdorp (53,881), Boksburg (43,472), and Benoni (32,478) are the most important, supported by contiguous mining undertakings. Potchefstroom, Middleburg, Barberton, Heidelberg, and Rustenburg are the most important from an agricultural viewpoint.

DESCRIPTION OF NATIVE PROTECTORATES.

For statistical purposes the native Protectorates in South Africa are considered part of the Union of South Africa, and separate figures for their trade are not available.

BECHUANALAND.

The Bechuanaland Protectorate must not be confused with the territory called British Bechuanaland, which is a part of Cape Province. This is much the largest of the three Protectorates, but a large part of the country is virtually a barren desert. Bechuanaland is essentially a pastoral country, and stock raising is the principal industry; cattle thrive everywhere and increase very rapidly. The rainfall is too small and uncertain to enable grain to be grown with a reasonable prospect of success, but the natives in some of the districts plow and sow every year; and, although the crops are usually small, occasionally there is a season of generous rains, when the harvest (chiefly Kafir corn, millet, and maize) is abundant. The Protectorate is inadequately served by railways, the only line traversing the country passing through the extreme eastern section—this being the line from Cape Town to Rhodesia, via Kimberley and Mafeking.

The northern plains of Cape Province extend into Bechuanaland. Its elevation is from 4,000 to 6,000 feet, and the rainfall in the west appears to be about equal to that of the western part of the Central Karroo, namely, 10 inches. Near Vryburg and Mafeking, however, an average for five years gave 30.38 inches. This indicates that in the extreme east the rainfall is more or less adequate, but the country thus watered is a very small portion of the total. It has been remarked of late that Bechuanaland is gradually becoming drier. In former years, it is said, the hippopotamus was found in many pools of the Kuruman River that are now nearly dry. The Kalahari Desert occupies a vast part of the area of Bechuanaland, and, as its name indicates, it is mostly a waterless land. During part of the year the natives have to rely for drink upon the fruit of the tsama, a species of melon.

BASUTOLAND.

Basutoland occupies the loftiest land in the part of the subcontinent of Africa in which it is situated. Its mean altitude is 6,000 feet. Basutoland is the head and center from which most of

the large South African rivers flow. The country is densely populated, and the steady increase of population among a pastoral people already numbering more than 400,000 is a serious problem. The land question is an urgent one, for the country is clearly overcrowded. A density of 40 natives to the square mile is a high one for South Africa. Basutoland is practically a great native reserve, and no European settlement is allowed within its boundaries save a handful of especially authorized persons.

The land is divided on the communal principle, and there are no individual proprietors. All the arable ground is under cultivation. Of its extent of 11,716 square miles, only 6,000 square miles are inhabited owing to the mountainous nature of the country. Basutoland is a much richer country than Bechuanaland. It possesses a fine climate and is fairly well watered. It is said to be the best grain-producing country in South Africa, but since agriculture is entirely in the hands of the natives, whose methods of farming are very primitive, the crops are not at all as large as they could be if the industry were developed along progressive lines. The principal crops are wheat, maize, and Kafir corn.

SWAZILAND.

Swaziland, the smallest of the three Protectorates, is situated at the southeastern corner of the Transvaal Province, Portuguese East Africa and Natal forming the eastern and southern boundaries. The area is 6,536 square miles, inhabited by 1,083 whites and 98,876 natives. The western portion of this Protectorate is high, grass covered, and well watered, averaging about 5,000 feet above sea level. The central portion consists of rolling downs of very fertile soil, also well watered, while the lowlands, about 600 feet above the sea, are malarial, covered with bush and of great fertility, but somewhat deficient in rainfall. The field crops are maize, Kafir corn, pumpkins, ground nuts, and sweet potatoes. The principal industry, however, is cattle raising, to which the country is admirably adapted. Several Transvaal companies are ranching in Swaziland on a large scale. During the winter upward of 250,000 sheep pass into this country from Transvaal Province to feed on its rich winter grasses. It is said that the country holds out much promise for the successful cultivation of cotton.

Swaziland is reported rich in minerals, but little has been done thus far in connection with the development of these resources.

ECONOMIC DEVELOPMENT.

Mining and agriculture are the two chief industries of the Union of South Africa, and, while the former is by far the most important, at the present time there are many indications that the latter, in the long run, will become the most extensive and permanent. Mining holds the supremacy for the time being, and the value of the mineral output of the Union far exceeds that of all its other products combined. Directly and indirectly, mining carries the superstructure of South Africa's trade, and it provides the bulk of the public revenue of the country.

MINING.

The Union of South Africa has a most valuable asset in its extensive mineral deposits, and mining activity prevails in all four Provinces. The chief mineral products are gold, diamonds, coal, copper, and tin, while a variety of base minerals, such as asbestos, graphite, magnesite, zinc, lime, and others are being produced on a smaller scale. Gold and diamonds constitute by far the two most important industries, and the Union holds the premier position among all countries of the world in the production of these two minerals. The total value of the mineral output for the year 1914 amounted to $217,130,126, distributed as follows: Gold, $173,559,975; diamonds, $26,703,429; coal, $10,846,922; copper, $3,369,346; tin, $1,515,384; lime, $505,697; silver, $498,003; asbestos, graphite, magnesite, lead, flint, corundum, $131,370.

The contribution of the various Provinces was: Transvaal, $188,827,824; Cape Province, $19,321,382; Orange Free State, $4,762,877; Natal, $4,218,043.

The mining industry expended, during the year 1914, $79,032,088 on salaries and wages and $59,490,699 on supplies and machinery. The laborers it employs number about 30,000 whites and 235,000 natives. This industry radiates into numerous channels, and supports thousands of people in Johannesburg, Kimberley, and throughout South Africa.

GOLD.

The advances made by gold mining in South Africa have been phenomenal. In 1884 the value of the gold produced amounted to $49,132. This increased to $188,451,319 in 1915. The total value of gold extracted from South African mines up to the end of 1915 reaches the huge sum of $2,216,996,800, and for the past few years these mines have contributed 40 per cent of the total gold production of the world.

This industry is in a very flourishing condition, and the output is gradually increasing. A few years ago it was thought that the gold mines would soon enter a period of exhaustion and that the production of gold would decrease. From present indications such will not be the case for some years to come. Much attention has been given lately to the unexploited gold reefs lying east of Johannesburg and known as the Far East Rand. These reefs are said to contain gold of a value equal to the aggregate production of that mineral in South Africa since the year 1884. They are the property of the State, and the question is debated as to whether the Government should lease them to private companies for exploitation or should itself undertake the work.

Gold mining in South Africa has, in a sense, ceased to be the perilous and uncertain undertaking so often characteristic of mining operations. Wealthy corporations are able to carry out any proposed operations to a conclusive issue. They possess ample capital to develop any properties that scientific investigation demonstrates to be capable of yielding adequate returns, so far as that can be said of any mining proposition. The employment of highly paid experts in all branches of mining and engineering has assisted in placing the industry on the soundest possible footing.

Gold production has exerted, and will continue to exert for many years, the most powerful influence upon all other branches of South African economics, and there is no reason to view with apprehension this influence, which can only be felt as most favorable in every respect.

One of the most interesting developments of recent years in connection with South African mining is that several of the most prominent mining magnates are taking an increasing interest in agriculture and stock ranching. Sir Lionel Phillips, one of the foremost mining capitalists, has been for many years president of the Witwatersrand Agricultural Society, which is admitted to be the largest and most influential agricultural organization in South Africa. The De Beers Consolidated Mines (Ltd.), of Kimberley, have undertaken extensive farming and ranching operations along the Vaal River—a section of the country that, owing to the existence of conditions most difficult for agricultural development, has so far remained undeveloped. The De Beers Co. is doing, therefore, a pioneering work in agriculture that can not fail to be of great benefit to the contiguous community. Sir Percy Fitzpatrick, another prominent mining man, is chiefly responsible for the Sunday River Settlement project, which aims to place several thousand people on the land, in a fertile valley near Port Elizabeth. Many more similar instances could be mentioned. The interest of these mining men in the land was chiefly prompted by a desire to ascertain and demonstrate the extent of farming development possible in South Africa when sufficient capital is available. More recently, they have been instrumental in raising large sums of money for the financing of irrigation schemes, the development of closer farming settlements, and other agricultural undertakings. These efforts deserve commendation and appreciation by the farming community, as they are chiefly inspired by altruistic motives and are intended to facilitate the introduction of progressive methods into South African agriculture.

DIAMONDS.

The diamond industry ranks second in importance. At present it is suffering a period of depression, due to the restricted demand for the product. The mines are in the hands of wealthy corporations, which seem well able to withstand this temporary setback. The possibilities of the industry are far from exhausted. The diamond mines of Kimberley and the Transvaal appear to be developed with the idea that it would be inadvisable to produce a greater output than the demand can readily absorb. When the public is again able to purchase diamonds, the mines will undoubtedly be prepared to produce them in sufficient quantities to meet the demand. In 1883 the value of diamonds exported from South Africa was $11,482,341, and in 1913, $58,478,419. It is stated that the exportation of South African diamonds to date has amounted to more than $925,000,000.

COAL.

Coal mining has made steady advances during recent years. The carboniferous areas in the Union are very extensive. Indeed, at a certain altitude coal has been found over nearly the whole of the country, the area where it is known to exist exceeding 56,000 square

miles. Many of the seams are from 10 to 20 feet thick, within 500 feet of the surface, and very easily worked. Coal, consequently, is very cheap, the values before the war at pit's mouth per ton of 2,000 pounds ranging from $1 to $1.50. In 1914, 8,477,923 tons were produced, valued at $10,992,917. The gold and diamond mines and other local industries, as well as the railways, constitute the chief market for the coal output. Natal coal is mostly bunkered by steamers calling at Durban, and shipments are made from time to time to India, Ceylon, Straits Settlements, and adjoining African countries.

OTHER MINERALS.

Copper and tin are the only base minerals other than coal that have so far been exploited to any appreciable extent, and only the Transvaal and Cape Provinces contribute to the output of these minerals. Copper mining has been carried on in Cape Province since 1852, in the neighborhood of Port Nolloth, on the western sea border, and some $47,000,000 worth of this metal has been exported so far from that Province. It was not till the year 1906 that success attended prospecting operations in the Transvaal. Operations quickly expanded, and up to the end of 1914 that Province had exported copper worth about $4,000,000. It is yet premature to speculate on the future of the copper-mining industry, but the general opinion is that the output is certain to increase from year to year.

The Transvaal is the chief producer of tin. The fields are situated in the Rustenburg and Waterberg districts. Zululand and Swaziland are said to contain large deposits of tin. The production of this mineral, which was worth $44,387 in 1906, had increased to $2,082,195 in 1913.

South Africa possesses an abundance of almost every mineral. Iron ore is found in every Province of the Union, and in Natal iron ore of a particularly good and pure quality is found in the neighborhood of Dundee. Asbestos, quicksilver, antimony, lead, silver, graphite, and zinc are beginning to be produced, and a number of these mining undertakings look very promising.

The importance of the mining industry of the Union of South Africa can not be overestimated, as its prosperous condition facilitates the development of other industries—agriculture in particular—in a degree otherwise impossible. Mining capitalists and laborers, instead of leaving South Africa after they have amassed the earnings of several years (as has been the case heretofore), are, in increasing numbers, settling on the land. There is also an increasing amount of local capital invested in South African mining undertakings, which will reduce the large sums of money sent to Europe every year to pay dividends to the holders of stocks of South African mines. Considering the relative soundness of South African mining properties, this means that it will become easier from year to year to obtain the capital necessary to exploit the rich agricultural resources of the country, and investments in South African irrigation schemes and the like give every promise of most handsome returns.

AGRICULTURE.

The general economic aspects of the agricultural and pastoral resources and production of the Union of South Africa are dealt

with more fully further along in this report. It would appear advisable, however, since the main points of South Africa's economic position are now being discussed, to indicate briefly in this place the part that the agricultural pursuits of the Union play in the economic structure of the country.

The agricultural and pastoral production of the Union of South Africa has increased to a very marked extent since the last Boer War. During the past few years the progress made has been much more apparent. The import and export figures available, and the consideration of the internal commerce of the country, give abundant proof of this. Many efforts have been made in recent years to improve the agricultural position of the country, and despite the fact that some of these endeavors have not yet had time to materialize, the situation has undoubtedly improved greatly. The country, it must be remarked, has not been free from deterring influences. Droughts of more or less intensity have affected large areas for the greater part of the past five years. Natural productiveness of a high order goes hand in hand with animal and vegetable pests of a virulent kind. What nature gives with one hand she is likely to take away capriciously with the other. Prices and risks are great. No country in the world calls for more rigorous application of scientific methods to its farming activities, and the agricultural future of the country must, for these reasons, be reviewed with a full knowledge of both the favorable and the unfavorable aspects.

The principal agricultural and pastoral products of South Africa are wool, maize, ostrich feathers, wheat, sugar, butter, hides and skins, mohair, wattle bark, Kafir corn, butter, beef, and fruit. Until recent years the Union's production of some of these commodities, particularly foodstuffs, proved insufficient to supply the local demand, and one of the anomalies of South Africa heretofore (and even now, in a large degree) is that large quantities of foodstuffs, which the country is admirably fitted to produce, have had to be imported. The absence of statistics as to the range of the local consumption from year to year makes it difficult to speculate as to what the country is doing to remedy that deficiency. The result of inquiries leads to the opinion that the country is fast approaching the time when the importation of products that can be produced at home will entirely cease. That there is a good deal of improvement in the situation appears without much doubt, and, while certain agricultural products are not increasing in quantity to the extent that would be desirable, one finds in a good many cases that decided progress has been made. To demonstrate this, the following table has been prepared, showing the exports of several agricultural and pastoral commodities (South African produce only):

Articles.	1911	1915	Articles.	1911	1915
Tobacco	$32,727	$176,673	Oats	$59,249	$139,853
Kafir corn	4,233	114,606	Eggs	26,366	101,213
Sugar, molasses, and treacle	69,503	242,288	Dried fruit	20,264	76,920
Meat	35,277	574,889	Hay and fodder	141,732	283,984
Butter	5,883	36,323	Hides and skins	5,895,896	8,155,252
Barley	1,834	31,311	Wool	18,978,513	26,181,921
Maize	1,959,642	3,073,905			

In addition to increasing the exports of certain produce the country has very substantially reduced the imports. The most notable cases in which this has taken place are shown by the following figures, giving the imports of several articles in 1911 and in 1915: Sugar and sugar produce—1911, $2,900,638; 1915, $883,017. Butter—1911, $1,217,812; 1915, $593,684. Eggs—1911, $278,835; 1915, $93,597. Meat and poultry (fresh)—1911, $576,865; 1915, $17,334.

A severe setback has been suffered in the exportation of ostrich feathers, wattle bark, and mohair. This, it is felt, is only temporary and largely the result of the war, since, with the exception of mohair, these products had been materially increasing up to the time the war started.

MANUFACTURING INDUSTRIES.

Few countries in the world depend so largely on other nations for necessary requirements as South Africa does, despite its many potentialities. Manufacturing, from a modern point of view, is practically nonexistent. Even the most elementary necessaries of life are imported in large quantities. Considering its small white population, its imports of $29,750,555 worth of food and drink in 1915, out of total imports of $164,650,932, disclose very backward conditions in this respect. The necessity for establishing industries in the country has been very much discussed for a great many years, but the progress made in that direction, as these figures indicate, has been exceedingly slow. Buoyant hopes are expressed of much industrial development in the near future, but it is feared that certain social problems that are closely interwoven with the development of industrial life, and that the country has yet to solve, are likely to affect unfavorably these hopes. Chief among these problems is the lack of opportunity of the natives to acquire education for industrial pursuits or experience as skilled workmen. The presence of the natives, on the other hand, is said to offer a considerable obstacle to the settlement of white labor in the country.

Manufacturing in South Africa has not yet emerged, to any marked extent, from the condition of providing some of the most elementary products and preparing into usable products various raw materials and foodstuffs. Leather and leather goods, harness, saddlery, furniture, boots and shoes, wagons and carts, cement, explosives, sugar, soap, candles, matches, bags, tobacco, and bark extracts form the principal industries of the country; these articles, with few exceptions, are inadequate for the middle and better class consumers and are also produced in insufficient quantities to supply the local demand. Flour mills, distilleries, breweries, mineral waters, confectionery, cigars and cigarettes, concrete, fruit canning and preserving constitute other industries of varying importance.

Owing to the scattered population the manufacturing of machinery is to be considered altogether impracticable for many years to come. There are no steel mills in the country, and but few establishments prepared to turn out iron and malleable castings.

In certain lines some progress has been made in recent years, and goods have even been exported to contiguous countries. These, however, are chiefly the products of flour and sugar mills, breweries and distilleries, candle and soap factories, as well as matches and the like and, to a certain extent, wagons, carts, explosives, cement, mineral waters, manufactured tobacco, and canned and preserved fruit.

A booklet recently published by the Cape Town Chamber of Commerce states that the exports from the port of Cape Town of goods that passed through processes of manufacture in the country increased thirtyfold in seven years, from $36,500 in 1906 to $1,015,500 in 1913, and that the total exports of South African manufactures in 1913 amounted to $2,350,000.

The industries most susceptible of development in South Africa are those in connection with the raw products of the country, animal, vegetable, and mineral, which, worked with comparatively simple machinery, might be profitably converted into articles of a higher value before they leave the country—that is, in the form of semi-manufactured goods or in that of prepared raw materials, made ready to be utilized in the manufacture of finished high-class products that South Africa can not as yet reasonably aspire to produce. If one-third of the hides and skins exported at present were manufactured into leather in South Africa, an industry could be built up amounting to $15,000,000 per annum, doubling the value otherwise received for the raw products. Jams, dried fruits, cured tobacco, wine, brandy, and fruit pulp should also be exported in increasing quantities. In these articles an export trade is necessary, since the country can not absorb the products already turned out by the local manufacturers. The war in Europe, with its consequent stoppage of the production of certain lines required by South Africa, has undoubtedly given an impetus to manufacturing in the country. This has been aided by the constantly rising freight rates and by the difficulty of securing bottoms to convey the goods to South Africa, these factors having turned the attention of the buying public to locally manufactured articles.

The establishment of industries in South Africa has not kept pace with the progress the country has been making in mining and agriculture, and present indications do not warrant great expectations of development in manufacturing pursuits, despite the great amount of discussion that this subject has received lately in South Africa. This is not meant to indicate that no progress will be made at all, but that, considering present conditions, it will take many years to develop manufacturing interests of any magnitude. An industrial population, it is recognized, would offer an important local market for the agricultural and pastoral produce of South Africa, and whatever manufactures the Union may be able to develop are practically assured of a wide market throughout the subcontinent of Africa. All countries situated therein are in a position similar to that of the Union, since they must import all manufactured articles. Some of these countries give every promise of a development that will increase the purchasing power of their inhabitants, and the Kongo, Rhodesia, and Portuguese East Africa would undoubtedly purchase South African manufactures if they were available.

Industrial education of a high order is unknown in South Africa, except on mining subjects. The School of Mines at Johannesburg is said to be most complete and well equipped in every respect. There are 10 elementary technical schools for boys and 9 for girls. These provide instruction for 1,500 children. The principal subjects taught are carpentry, joinery, wagon building, blacksmithing, harness and boot making, tailoring, printing, dressmaking, cookery, and other similar rudimentary industries.

II. REVIEW OF SOUTH AFRICAN AGRICULTURE.

HISTORY AND DEVELOPMENT.

To account for the limited agricultural progress of South Africa until recent years, it is necessary to consider the nature of the country itself, the people who first populated it, and how they settled on the land.

As long ago as the second half of the seventeenth century, when Holland figured among the great commercial and colonizing powers of the world, the Dutch East India Co. established a revictualing station for its ships at the Cape of Good Hope. The country then was new, vast, and attractive; accounts of its advantages soon reached Holland, and immigration from that country began. The revocation of the Edict of Nantes in 1685 led to the immigration into South Africa of several hundred French Huguenots. With the coming of these two races, South Africa began to be settled by men whose chief attributes were the spirit of independence and the instinct of freedom. For a great many years the population was small, whereas the land was limitless. This led the immigrants to occupy large and isolated farms, instead of settling in communities. In the course of time the country, in itself a very large one, became occupied from end to end by a very small and much scattered European population, far removed from the advantages of education and easy intercourse and with a limited market for its produce and live stock. Under these conditions the inhabitants had to strive to become altogether self-supporting, and the production of anything except what was needed for their individual support was discouraged, since without railways or close markets it was impossible to find an outlet for their produce. Farming, therefore, was not undertaken for a monetary profit, and the chief concern of the farmers was to maintain themselves independent of outside supplies.

Not all the settlers proceeded along these lines. A large number of them remained in the southwestern districts, where they developed communities fully abreast of those in Europe as regards civilization and ideals. These were disturbed, however, with the coming of the British, at the beginning of the eighteenth century. The liberal views of the British Government respecting native policy, which culminated in the abolition of slavery in 1834, led to the great Boer trek over the Vaal River, and the founding of the Orange Free State and Transvaal Republics. Here, again, each family occupied a large farm in a country which at that time must have proved most inhospitable. The nearest seaport was at least 400 miles away, the country was infested with wild and dangerous animals and inhabited by a black race that often proved most warlike. The land itself, while relatively good, lacked an adequate rainfall and it was different from that with which they were familiar. The pastoral inclinations of the new inhabitants, in addition to their self-centered and independent nature,

induced them to settle the country sparsely in a manner that corroborates the saying that the prevailing idea at that time was for a new settler to build his homestead where the smoke from the neighboring farm could not be seen from his own. This made it almost impossible to establish even the most elementary principles of government and community life. Education was nonexistent, and the civilization that the early settlers had carried from Europe tended to disappear in the course of two generations. Here, then, was produced in the main, in the course of two centuries, a situation exactly the reverse of what was required for the advancement of agriculture. Instead of small holdings, intensely cultivated, there were large farms hardly cultivated at all, and used chiefly for the pasture of cattle and sheep. Instead of proximity to markets, rapid transport, much intercourse, and good education, there were distant markets, slow wagon transportation, infrequent association, and scarcely any education.

The effect of the contact of the European population with the native races is also important. On the European was laid the task, for his own protection, of civilizing the barbarian. The latter gained; but it was inevitable that the former should lose. In the sphere of labor the native exerted a marked influence on his European master. Since the native labor is not yet efficient, it is difficult to estimate the retardation that agriculture suffered from this cause alone.

The continuous political changes also proved a great drawback. The land, the only resource the country was believed to possess until 50 years ago, remained for these reasons practically untouched.

AGRICULTURAL AWAKENING AFTER ANGLO-BOER WAR.

The discovery of the diamond and gold fields at Kimberley and Johannesburg, and the establishment of other centers of population, found the resources of the country utterly inadequate to meet the demands for foodstuffs. Famine prices obtained, thanks to the total absence of any local supplies. No great efforts were made by the farmers to cater to the rich markets that had sprung up under their eyes. For many years, with few exceptions, they pursued the even tenor of their ways. The real awakening to the agricultural possibilities of the country did not take place until after the Anglo-Boer war. The war coincided with the breakdown of the old patriarchal system of farming. The old-fashioned farmer, before that time, took his cattle to the highlands during the summer and trekked to the lowlands in the winter. Stock raising (and stock of a very inferior kind, with the herds running wild) was his principal concern. When disease swept down and decimated his herds, he sought to avoid such evils by a trek into another district, the result of which was to spread infection broadcast through the country. The farms were of huge sizes, mostly holdings of 6,000 to 8,000 acres, but practically no use was made of them save for cattle grazing. Just enough of the soil was scratched to produce sufficient wheat and corn for the needs of the household. The very foundations of agricultural organization were lacking. The only assistance given by the former Government of the Transvaal for the advancement of agriculture was a sum of about $75,000 per annum, distributed among various agricultural societies.

After the Anglo-Boer war the country entered upon more settled political conditions. Mining was prosecuted with much greater vigor, and an increasing population, of a great purchasing power, at last lifted the blind that had obscured the richness of the land for so many long years. Railway construction was diligently pursued, and in 10 years the mileage of the country was nearly doubled.

PROGRESS MADE AND DIFFICULTIES ENCOUNTERED.

What the Government and the farmers themselves have done during the past 15 years to promote greater farming production is not yet fully visible, as it is natural that, after the war and so many years of passivity, there should have been a vast amount of reconstructive work to be done. Diseases of live stock have, in particular, greatly retarded advance and, while much has already been accomplished to eradicate and control them, much has still to be done. One of the chief obstacles encountered has been the difficulty of adequately controlling the native locations, as well as the practice (still somewhat prevalent) of moving the stock from one part of the country to another, in order to obtain satisfactory grazing. The true nature and vitality of the early occupants of South Africa have already become manifest, and one of the indications that South Africa is to have a great agricultural future is to be found in the evidence already given by many Dutch farmers that under congenial conditions, and with a proper stimulus, they can become as progressive farmers as those of any other country. No thoughtful man, after seeing what is being done by them in the Transvaal and eastern Orange Free State and in the southwestern districts of Cape Province, can fail to admit that, considering the very precarious and backward conditions in which they lived and farmed for more than two centuries, they have done splendidly during the past 15 years.

There remain, undoubtedly, many farmers who have not yet been noticeably influenced by this new order of things, and among these there still prevail much indifference and neglect in observing the regulations promulgated to free the country of animal and plant diseases. They fail to dip their cattle systematically, and often they will move their stock through sections of the country already free from disease. Laws have been enacted to compel the dipping of diseased live stock, and at the end of 1914 33,000 dipping tanks had been erected. A fine is imposed upon those farmers who fail to comply with these regulations. It is estimated that no less than 1,447,000 animals died from disease in 1913. Appalling as this figure is, it shows an improvement over the conditions prevailing two years before, when 1,717,600 animals, according to the census of 1911, died that year from disease, in addition to 3,780,221 that died from unknown causes. The Government maintains laboratories for the study of veterinary science at Ondertepoort, near Pretoria, which are said to be more elaborate and complete than those in any other similar institution in the world. That institution receives a grant of $250,000 per annum, and Sir Arnold Theiller, a Swiss expert, the head of the establishment, has a staff of between 30 and 40 assistants under him. To the law making compulsory the dipping of cattle can be attributed the satisfactory increase of large cattle in the Union that has taken place in the past few years. These numbered 5,796,949

in 1911, whereas it was estimated some months ago that about 8,000,000 cattle were then in the country. This has already had the good effect of directing the attention of European buyers to the possibility of obtaining meat supplies in South Africa, and various trial shipments made in 1914 have already resulted in an order for 40,000 quarters of South African beef, and a number of small orders have been placed during the course of 1916. Trial shipments of lambs have already been made. An export trade in South African meat, of large dimensions, is, from all appearances, well in sight, and this new trade will undoubtedly prove a most substantial encouragement to notable agricultural development. South African farmers are also well aware that the country can never expect to become a meat-exporting country without adequate supplies of winter feed, and as a result the area devoted to crops is rapidly increasing.

Great progress has also been made in recent years in connection with the conservation and utilization of water—that is, in storing water by means of dams and using the flood water of the larger intermittent rivers that are in flood after the thunderstorms (in which form, as has been said, most of the rainfall in many sections of South Africa is obtained). This has resulted in thousands of acres of the dry Karroo and adjoining areas being planted with alfalfa and other crops. This system of flood-water irrigation has also been utilized with great success in the growing of wheat in certain sections of the northwest, where the rainfall is so small that no crops of any kind could be raised except in this manner. The extension of this system, coupled with a better understanding of adequate methods of soil cultivation, to the end of making the most of all moisture available, is certain soon to make the country self-supporting as regards its wheat requirements, and it will be conducive also to an increase in the area under other crops.

The amelioration of the soil is also receiving more attention than ever before, and diversified farming and crop rotations are beginning to be practiced by an increasing number of farmers. The abundance of virgin soil, where the growing of crops could be moved on as soon as the cultivated lands showed signs of exhaustion, has retarded progress in this respect, but this condition of affairs is being gradually done away with, and the day is not far distant when the farmers will find it both advisable and necessary to cultivate the same land year after year. They are also beginning to appreciate that it is more profitable to farm a small area properly than to plant large areas with the idea of producing a crop with just as little cultivation as possible. Artificial manures are more freely used and pains are taken to improve the pastures by more systematic grazing and the growing of grasses like Paspalum and Tall Fescue. The burning of the grasses in the winter, a practice followed by many South African farmers for many years, is gradually declining as the country becomes more closely stocked and the farmers more enlightened. The growing of food for live stock on arable land, seldom practiced in the past, is becoming more and more common.

One of the positive signs that South African farming is on the upgrade is the fact that agricultural land is becoming dearer. In the last decade, on an average, farms have probably more than doubled in value and in some cases considerably more. This must certainly

be accepted as a sign of the farmers' prosperity and of confidence in the country, and as conducive to better farming and closer settlement. There is an increasing disposition to plow the land as soon as possible after the crop has been removed in order to insure a good tilth of the soil for the next crop. Heavy horses, instead of oxen, are beginning to be used for working the soil, and there are also in use a number of steam plows and steam and oil tractors. It is not improbable that before long the cultivation of the land by horses and mechanical agencies will be as common in South Africa as in other countries.

DEMAND FOR FOODSTUFFS GREATER THAN DOMESTIC PRODUCTION.

For several years to come South African farmers will have the advantage that they have had continuously for the past 25 years, in that the demand for foodstuffs will be greater than the supplies produced in the country. Much has been done in recent years to overcome this deficiency. It has been felt all along to be a deplorable condition that a country like South Africa, which finds it so difficult to secure sufficient capital to develop the resources of its land, should send away every year to foreign countries large sums of money to pay for food and drink imports for its small population of a little over one million and a quarter white inhabitants. During the five years ended December, 1915, not less than $160,000,000 had been sent abroad for this purpose. The value of these imports during 1915 was approximately $30,000,000. These figures have been placed continuously before the farming population, and there has arisen a determination to rectify this anomaly in the next few years. The excess of demand over supply is attributable to the progress of the mining industry, which, in addition to the large number of people it employs, supports indirectly a large population, thus providing the means with which to prosecute other industries, all of which enhance the demand for the products of the land. The thoroughness and activity with which mining is prosecuted, furthermore, radiate inspiration and stimulus to the whole nation, awakening and encouraging the vitality and energy of the country and its people.

GAINS INDICATED BY FIGURES AND PERSONAL OBSERVATION.

The almost complete absence of records and statistics makes it rather difficult to undertake a systematic review of the development of agriculture in South Africa during recent years. The following figures from the census of 1904 and that of 1911 afford eloquent proof of the gains made by agriculture during that period:

Items.	1904	1911	Items.	1904	1911
Number of European farmers	77,926	97,381	Ostriches	360,830	746,736
Cattle	3,500,453	5,796,949	Sheep	16,322,503	30,556,659
Horses	449,539	719,414	Goats	9,770,545	11,762,979
Mules	134,734	93,931	Pigs	679,084	1,081,600
Asses	141,930	336,710	Poultry	6,312,446	10,533,909

No figures of the acreage under cultivation or of the output of farm produce were obtained in 1904. In default of these figures, to make comparisons possible one must depend on the views and opinions expressed by the men who have witnessed the agricultural development of the country during the past two decades, and it is pleasing to observe that in not a single instance has there been hesitation in affirming that the advance made during that time has been truly remarkable. If figures pertaining to the Transvaal were available they would probably produce astonishment, for great progress has been made in agriculture by that Province during the past few years. It would not be surprising if some one disagreed with these views, because South Africa's agricultural progress is of a different nature altogether from that in the United States, Canada, or the Argentine. South Africa operates under many disadvantages as compared with those countries, and its agricultural development can only be gradual, even though steady, and without great booms, nor is it likely ever to be of a spectacular character.

FAVORABLE CONDITIONS AT PRESENT.

In spite of the war, farms are at present being taken up in parts of the Union that were hitherto neglected, and in the older and more favored districts they are being subdivided. More land is being broken up, and more care is devoted to the cultivation of crops. Live stock is increasing in numbers and improving in quality. Farmers are busily engaged in fencing their farms, obtaining and conserving water, erecting buildings and dipping tanks for cattle and sheep, and, to a less extent, in planting trees and generally taking steps to increase the productivity of their farms and reduce the cost of working them. Everywhere signs of achievement and progress and reasons for anticipating still greater advances are easily discernible.

That there has been a general uplift in South African agriculture can not be denied. It is doubtful whether of late years agriculture has made greater strides or farmers on the whole have been more prosperous in any part of the world than in South Africa.

AREA OF LAND CULTIVATED.

The following table, compiled from the census of 1911, shows the area of land under cultivation in the Union of South Africa, that lying fallow, grazing land, and land under irrigation. It is not likely that there has been much change in the relative order of these figures since 1911, but a notable increase has undoubtedly taken place as regards the area of cultivated land, variously estimated at between 20 and 30 per cent.

Provinces.	Total area of Province.	Under cultivation.	Lying fallow.	Grazing.	Under irrigation.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Cape Province	180,091,445	2,045,959	791,433	121,923,200	592,970
Natal	22,409,102	1,011,794	224,641	9,015,926	39,209
Transvaal	70,120,357	2,005,133	468,497	30,025,487	238,887
Orange Free State	31,996,946	1,831,351	390,579	27,920,386	103,546
Total	304,617,850	6,894,237	1,875,150	188,884,999	974,612

CAPE PROVINCE.

The southwestern districts of Cape Province show the largest acreage under cultivation. Malmesbury leads all districts of Cape Province and of the Union, with 300,472 acres of land under cultivation and 175,291 acres lying fallow. Piquetberg, Paarl, Caledon, and all the districts from Clanwilliam and Ceres in the north of that section to Swellendam and Bredasdorp in the south in a westerly direction, have also a large area of developed agricultural land. The eastern districts, from Aliwal North in the north and Wodehouse and Queenstown in the center to King Williams Town and East London in the south, are also among the most important in the Province in this respect. Albany, where Grahamstown is located, Uitenhage, and Oudtshoorn are equally important. The districts along the entire coast of the Province, except those in the extreme northwest, those contiguous to Riversdale and Mossel Bay, and a few others, are comparatively well cultivated. The less-cultivated sections of Cape Province are in the north and northwest. The districts of De Aar, Hanover, Hay, Hopetown, Kimberley, Phillipstown, Port Nolloth, Prieska, Barkly East, Carnarvon, Fraserburg, Riversdale, Mossel Bay, and the Karroo in general, are among these.

NATAL.

The districts along the entire coast of Natal and those in the extreme west of this Province are the most intensely cultivated. The district of Klip River heads the list, with 218,433 acres of land under cultivation; Eastcourt, Inanda, and New Hanover follow next, and Richmond, Umlazi, and Umvoti show a larger acreage under cultivation than the other districts not mentioned. In the territory around Pietermaritzburg much use is made of the land for agricultural purposes, especially toward the north and east of that city. In Zululand the districts along the coast have relatively large acreages under cultivation, but those back of the coastal belt, toward the northwest, are perhaps among the less densely cultivated districts of Natal. The strip of land in the center of Natal running from north of Paulpietersburg to Impofana in the south is the least-developed agricultural section of Natal.

ORANGE FREE STATE.

The most intensely cultivated districts of Orange Free State Province are along the northeast—Bethlehem, Ficksburg, Harrismith, Heilbron, Kroonstad, Ladybrand, Senekal, and Winburg, with Lindley, Vrede, Thaba-N'Chu, and Vredefort following in importance. In the northwest there is more land under cultivation than in the southwest, although, generally speaking, there is very little land under cultivation west of Bloemfontein, this section being the least developed of that Province along agricultural lines.

TRANSVAAL.

It can be said that there is a great deal of uniformity in the distribution of land under cultivation in the Transvaal, and that all the districts are relatively increasing that area. The eastern districts

are by far the most intensely cultivated. These are Middelburg, Standerton, Barberton, and Ermelo. On the other hand, Potchefstroom, Marico, Rustenburg, Lichtenburg, and Voolmarastad are not to be considered as much behind those in the east. Pretoria and Heidelberg are also among those showing large acreages of land under cultivation. As a matter of fact, all the southeastern districts of the Transvaal show up well in this respect, and there is also much cultivated land in some of the northern districts, as is shown by the fact that the district of Zoutpansberg leads all the districts of Transvaal Province in acreage under cultivation, with 255,712 acres (its area, it may be noted, is the largest of any Transvaal district). The less-cultivated portions lie toward the extreme north of the Province, chiefly because of the inadequate transportation facilities and the sparseness of the population, and toward the west, where the main reason is the absence of an adequate rainfall.

While no figures are available for comparing the area of land under cultivation in 1904 with the area cultivated in 1911, when the last census was taken, the increase in the Transvaal must have been considerable. This Province, until recently, did not produce sufficient maize (the staple crop) even for its own consumption, whereas it now contributes largely to the Union's exports of this cereal, in addition to providing for the wants of the increasing native population in its mines.

The chief crops grown in the area under cultivation are as follows:

Provinces.	Wheat.	Oats.	Barley.	Maize.	Kafir corn.	Rye.	Alfalfa.	Sugar.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Cape Province	485,019	500,037	90,304	242,327	19,332	90,503	128,463	23
Natal	2,326	16,629	2,583	231,667	8,108	865	2,723	64,228
Transvaal	73,072	102,193	5,949	892,113	52,769	665	14,340	174
Orange Free State	236,682	184,512	8,910	905,502	85,084	15,447	9,529	5
Total	797,099	803,371	107,746	2,271,609	165,293	107,480	155,055	64,430

Peas, beans, potatoes, sweet potatoes, pumpkins, onions, mangel, beets, tobacco, paspalum and other imported grasses, groundnuts, sugar cane for cattle food, tea, and manna account for 243,138 acres.

It will be seen that the land devoted to maize (2,271,609 acres) represents more than one-half the total area under cultivation (4,715,221 acres). The amount of land under cultivation, it may be noted, does not correspond with that given elsewhere under the same heading. Both of these figures are taken from the census of 1911, and quite possibly the discrepancy may be accounted for by the failure of the farmers to specify the crops grown in their cultivated lands when they returned the census blanks.

AREA OF LAND CAPABLE OF FUTURE CULTIVATION.

Upon referring to the table on page 38, it will be seen that the present area of land under cultivation or lying fallow in the Union of South Africa is less than 3 per cent, a small proportion indeed of the total area of the country. The possibilities of increasing the cultivated area are undoubtedly enormous, but there are also large areas that will never be able to support a large white farming population.

So far the line of least resistance has been pursued in selecting land for cropping, and the land now under cultivation can be said to be the choicest in South Africa. Owing, however, to the farms averaging probably 2,000 acres—of which, at the most, only one-tenth has been thus far utilized for agriculture—it is possible to increase largely the acreage under crops in those partly developed farms where it has already been proved that farming can be carried out successfully.

In other words, farming in South Africa has so far been done in patches, and the area of cultivated land can be greately increased by working the land contiguous to these patches. The subdivision of farms that takes place with every generation and the higher prices being paid for good farming lands will undoubtedly accelerate the increase in the area of land under cultivation. That there are many million acres susceptible of carrying profitable crops is undeniable, and one of the anomalies to be observed in South Africa is the large blocks of undeveloped but fine and rich land that adjoin small fields carrying most excellent crops. There are also possibilities of development in sections of South Africa that so far have been altogether ignored or overlooked from an agricultural viewpoint. The northern Transvaal, for instance, is claimed to have many millions of acres of good land capable of cultivation. Numerous small tracts of most fertile soil can also be made productive with relatively inexpensive irrigation schemes and with the adoption of better methods of cultivating than those prevailing in the country at this time.

Some of the northwestern districts of Cape Province and the western sections of the Orange Free State and Transvaal Provinces give very little promise of becoming susceptible of much agricultural development, because of the very small rainfall there. The land in many cases is even unable to support the white population at present settled upon it. The agricultural development of the immense Karroo can only take place with the aid of irrigation, and for this reason there can only be a gradual increase in its cultivated area.

On the labor supply, the availability of capital for irrigation enterprises, and the general adoption of improved methods of cultivation hinges the question of increasing the area under cultivation in the Union of South Africa. A fair improvement is noticeable, which will be quickened as soon as the South African farmer, by improving his methods, attracts both the labor and the capital necessary for the exploitation of the rich resources of the land.

WATERCOURSES AND RAINFALL.

South Africa is a country in which the supply of water in proportion to its size is relatively small. In the high mountain areas there is, generally speaking, an abundance of water, but the lower and flatter areas are very deficient in this respect. The rivers are generally flowing in deep river beds, with little fall in them, and the consequence is that it is often an expensive operation to utilize their waters for agricultural purposes. In the dry Karroo areas conditions are even worse, for the majority of river beds are rushing torrents in times of rain while at other times they are almost totally dry, with only a series of water pools here and there. One of the

chief problems of the country is to conserve the water that runs to waste and to utilize it for agricultural purposes.

Generally speaking, and excluding the coastal belt, the rainfall increases as one goes east and north; that is, the rainfall is lowest in the west and increases as one goes east, lower in the south and increases as one goes north. Again, the soil is richer in the west than in the east, in the south than in the north. The population is distributed less, however, according to richness of soil than according to rainfall, especially regularity of rainfall, which determines the productivity of the soil and its ability to sustain population. Unfortunately, nearly the whole country, so far as rainfall is concerned, is dependent upon a summer precipitation that is somewhat irregular and uncertain and, over a huge area, deficient as well. The wettest spot in South Africa is on Table Mountain, in the immediate vicinity of Cape Town, where there is a very small area with an average rainfall for seven years of about 87 inches. The driest spot is in Walfish Bay, where the average rainfall is only 0.3 inch. Taking South Africa as a whole, however, the wettest regions appear to be Zululand, Natal, and the southwestern districts of Cape Province, with a mean annual rainfall of rather less than 40 inches. In the Port Shepstone district, in Natal, the rainfall averages 45.08 inches yearly, and throughout Natal the average is between 30 and 40 inches. In the Transvaal the districts of Barberton, Belfast, Johannesburg, and Pilgrims Rest all enjoy an average minimum of 30 inches, while in the Orange Free State the eastern districts are the best watered. The Cape Province, owing to its vastness, shows a great variation in the rainfall. The mean annual precipitation in Cape Town is 25.54 inches, and the Herschel district in the east heads the list with 28.70 inches, while the Carnarvon district in the northwest shows up with 8.18 and the Fraseburg district with only 6.74. The driest regions are the northwest, including its coast, and the west central Karroo, where the mean annual rainfall is as low as 10 inches.

Generally speaking, the southeastern part of the Cape Province has its rains in the winter; the rest of that Province and the other Provinces of the Union have the rains in the summer. There is a great fluctuation in the yearly rainfall of the Union. A maximum year may give from three to five times as much rain as a year of minimum fall. In Bulawayo, Rhodesia, there have been years of 43 and 45 inches, and years below 15 inches; as low as 9 inches in localities 4 miles distant from the place where 45 inches had been registered in a heavy year. In Mafeking a year is on record with 47 inches and one with 16 inches. In the Waterberg district a year of 60 inches and one of 14 inches are recorded. These extremes are sufficiently frequent not to be treated quite as exceptions. In the Karroo the rain often shows some curious aspects. In a few places showers will fall across a farm in a path only a few hundred yards wide, and the track of the raindrops can easily be seen a few days later by the way every living animal crowds to the stretch of green feed growing in that strip of land.

STATISTICS OF RAINFALL.

The following table contains the rainfall averages of several of the cities of the Union, which to some extent are indicative of the rainfall in the adjacent areas, although, as stated before, there is a great

variation in the rainfall within very small distances. It shows also the rainfall obtained during the summer (October to March) and that obtained during the winter (April to September):

Cities.	Number of days in which rain fell.	Annual rainfall.	October to March.	April to September.
		Inches.	*Inches.*	*Inches.*
Cape Town, Cape Province	86	25.01	4.84	17.14
Port Elizabeth, Cape Province	80	20.93	8.11	12.82
Ceres, Cape Province	68	41.07	8.37	32.70
Prince Albert, Cape Province	36	13.20	5.93	7.27
Graaf Reinet, Cape Province	56	17.15	9.58	7.57
Bloemfontein, Orange Free State	36	9.63	6.21	3.42
Somerset East, Cape Province	89	30.67	21.45	9.22
Grahamstown, Cape Province	83	29.96	17.01	12.95
Cradoch, Cape Province	54	14.50	9.09	5.41
Queenstown, Cape Province	79	23.31	17.89	5.42
Aliwal North, Cape Province	72	22.64	14.81	7.83
Kimberley, Cape Province	62	18.26	13.64	4.62
Bloemfontein, Orange Free State	66	21.29	14.66	6.63
Umtata, Cape Province	81	24.28	18.24	6.04
Pietermaritzburg, Natal	123	29.42	24.19	5.23
Durban, Natal	152	39.48	27.82	11.66

Other annual averages of rainfall are as follows:

Transvaal.—Pretoria, 25.32 inches; Johannesburg, 30.77; Bethal, 25.38; Bloemhof, 19.03; Ermelo, 37.26; Heidelberg, 25.47; Lichtenburg, 19.73; Potchefstroom, 23.24; Waterberg, 23.84; Pietersburg (district of Zoutpansberg), 20.20.

Orange Free State.—Harrismith, 27.62; Kroonstad, 25.18.

Natal.—Newcastle, 36.28; Dundee, 29.61; Weenen, 25.83; Eastcourt, 28.39.

Cape Province.—Mafeking, 24.56; Bedford, 27.68; Butterworth, 30.36; East London, 24.43; Fort Beaufort, 22.39; Herschel, 27.95; Humansdorp, 25.79; King Williams Town, 24.79; Peddie, 24.05; Oudtshoorn, 9.44; Sterkstroom, 22.50.

Portuguese East Africa.—Lourenco Marques, 28.27.

Rhodesia.—Bulawayo, 20.74; Salisbury, 30.16.

Basutoland.—Maseru, 31.88.

DROUGHTS.

The great difficulty to be solved in South Africa is drought. The question of water is a very pressing one and affects the prospects of agricultural settlement at every turn. South Africa is but poorly supplied with rivers. For months no rain falls; then devastating storms sweep over the country with an enormous amount of water that runs to waste in a few hours. The average rainfall of South Africa (the Karroo excepted) is not small, but whereas elsewhere the rainfall is distributed with continuity and regularity throughout the year, in South Africa the rainfall is crowded into a few days or weeks, to give way to sunshine and dryness for the rest of the year.

The high plateau in the interior does not make for the conservation of moisture. Water runs off such a plateau and rivers cut deep into it. Such streams as exist, therefore, are for the most part sunk at considerable depth and their overhanging banks make them of little use for practical purposes of irrigation. During the rainy

season these attenuated streams become swollen to the dimensions of torrents, and the conservation of this flood water is one of the most urgent things in South African farming. During the year 1915 alone, 2,514,769 sheep and goats died as a result of the drought that, with more or less intensity, prevailed in the midlands and northwest of Cape Province during the previous four years. In 1911 there were 25,077,926 sheep and goats in that Province and only 22,223,194 at the end of 1915. Considering the natural increase that should have taken place during that time, it will not be difficult to realize the great losses that must have been suffered during that period, by this branch of farming alone, as a result of drought. A great many stock farmers were totally ruined, and even many progressive farmers who had taken careful steps to meet the almost constantly recurring droughts were thrown into absolute poverty. The Government had to come to the rescue of a large number of these farmers, and public works and irrigation schemes were undertaken with a view to affording employment to the farmers whose means of livelihood had entirely disappeared. The railways established special rates—only one-third those ordinarily prevailing—for the transportation of live stock from the drought-stricken areas to new pastures, but unfortunately the part of the country where the drought was most severely felt is poorly supplied with railways, and the farmers are situated too far from them to avail themselves of such concessions. In many parts a drought of such intensity had not been experienced for the past 30 years, which is saying a good deal, since South Africa is noted for the recurrence of droughts. The conditions were so distressing in certain districts that the natives were actually stealing sheepskins from which they further scraped the wool in order to use the bare skin for food. Even in some of the best-watered areas of the Karroo severe conditions prevailed. and in certain parts of the country back of Graaf Reinet the rainfall for the 18 months ended December, 1915, was only 7.69 inches.

In view of these conditions, the floods that occurred in the early part of 1916 along the Gamtoos River offer a painful contrast. The rainfall at Willowmore in 1915 was only 5.60 inches, the lowest in 38 years, and during the first days of 1916 7 inches of rain fell in a few hours right in the heart of the drought-stricken area, resulting in a very destructive flood and causing the loss of several lives and of large numbers of live stock, as well as a direct material loss variously estimated at between $500,000 and $750,000—a big loss for a district so poorly developed.

It is interesting to note in connection with the very small rainfall in certain parts of Africa that 100 years ago the famous traveler Lichtenstein, speaking of the extreme fertility of the mountains near Naauwpoort, now practically in the heart of the arid Karroo, attributed it to the perennial nature of the streams and the presence of numerous vleis and of rich grasses. Dr. Moffatt, a veteran missionary of Griqualand West, where Kimberley is situated, tells of "persistent rains which clothed the very rocks with verdure, and of the richness of the natural vegetation in which the cattle walk up to their bellies in grass." To-day these two districts are incapable of raising a crop without irrigation. It seems remarkable that in so short a time such a great change should have taken place in these sections of

South Africa, since now they are both arid in the extreme. It is generally assumed, in this connection, that the primitive conditions of South African settlement and farming that prevailed before the Anglo-Boer War have been mainly responsible for such an undesirable change. Even up to the present time little has been accomplished to bring about a proper general understanding of the principles of conservation as affecting the fertility of the soil and the rainfall.

There are few countries in the world that present so monotonous and so desolate an appearance as many parts of South Africa. Hundreds of miles are often traversed without a tree being seen, and in the winter large areas of the country are wholly depleted of all vegetation or of any covering whatever. This is partly the result of the long-followed practice of burning the grass every year, also of cutting down all trees for the purpose of obtaining props for the mines. The result of this is that whenever rain falls it finds the ground baked hard by the continuous and intense sunshine and without any obstacle to arrest the water from rapidly rushing away, carrying with it to the lower areas the top soils, those which in the main carry the most humus and fertility. Thus an acute desiccating process has been going on for many years, which is believed to be responsible to a great extent for the droughts that so constantly and fiercely succeed one another.

The question of conserving the resources of the soil is absorbing a great deal of attention in South Africa at present, and, while the large area of the country, its small population, and the relatively small public income from the farming community will probably prevent the Government from undertaking afforestation and other counter schemes on a big scale, as the rural population increases its knowledge and experience it will demand laws to prevent a continuance of the prejudicial practices that have made for the deterioration of the fertility and vitality of the land, and will induce individual initiative to palliate the disastrous effects caused by past ignorance and indifference.

In considering the question of droughts care must be taken to note that they do not prevail (at least with the intensity described) in all parts of South Africa and that they occur principally in those areas where the chief occupation of the farmers is stock raising. The Karroo areas, the northwest of Cape Province, and the western districts of Orange Free State and Transvaal Provinces, as has been pointed out in several instances, have an inadequate rainfall, and it is in these regions that the farmers are constantly threatened by droughts. These areas are mainly devoted to stock farming, except where irrigation is resorted to, and they are also inhabited, generally speaking, by the less progressive farmers of South Africa, who have often been encouraged to move on to more suitable areas of the country, but who, owing to their conservatism, stay persistently on the land of their ancestors. The best-watered sections of South Africa are not immune to droughts, but these recur with much less frequency and intensity. The southwestern districts of Cape Province, the eastern districts of Cape, Orange Free State, and Transvaal Provinces, and, generally speaking, most of Natal are the sections to which South Africa is chiefly looking for expansion in agricul-

tural industry and where, with an unsatisfactory season now and then, farming is carried on with a great deal of stability and uniformity.

IRRIGATION.

Owing to the scanty rainfall in many parts of South Africa the question of irrigation is of very vital importance, and consequently it is given a great deal of attention by the Government and private agriculturists. The late droughts have also served to convince many farmers that irrigation for the growing of winter feed is necessary to place stock raising on a successful plane. In South Africa, because of the deficiency of humidity in the atmosphere, it is often necessary to adopt partial irrigation even where the rainfall is from 20 to 30 inches per annum. The sun, being much stronger in the Tropics than in temperate latitudes, causes more water to be caught and to evaporate again before it can escape to safety below the soil than is the case in colder climates. A rainfall of 25 inches, sufficient for the needs of a crop in temperate latitudes, amounts to almost a drought in equatorial regions. The amount of annual evaporation of exposed water in South Africa is said to range from 4 feet in the lowlands to 7 feet in the highlands.

The department of irrigation is considered of such importance that it has a status of its own and is not a part of any other administrative department of the Government. Large sums of money are annually appropriated to stimulate the increase of the area of South Africa under irrigation, and loans are made to the farmers for the erection of irrigation works on plans approved by that department. At the end of March, 1914, the balance outstanding on account of irrigation loans was $3,133,610, and during the fiscal year 1913–14 the amount advanced was $930,365. Famous experts on irrigation have often been engaged, both before and since the Union was formed, and a number of very ambitious undertakings have been under consideration. Sir W. Willcocks reported several years ago that some 3,000,000 acres could be brought under irrigation in the Cape, Orange Free State, and Transvaal Provinces for an outlay of $150,000,000. He calculated the value of the irrigated land, now almost worthless, at $150,000,000. Other investigations show that there are immense possibilities for irrigation in every section of the country. The difficulty of obtaining the necessary capital has obstructed the undertaking of extensive enterprises, but the Government in the meantime has assisted individual irrigation schemes, and thousands of acres are added to the irrigated area every year.

It is but a few years ago that irrigation of land in South Africa, except in the Oudtshoorn district, was a trifling affair. During the past few years, largely as a result of the assistance given by the Government, irrigation development has taken place on a fairly large scale, and well-founded hopes are expressed for much advance in this direction in the next few years. One of the drawbacks in the past has been that the water laws of South Africa were framed and based upon those existing in countries from which the original European settlers came, in which humid and water-logged conditions exist, instead of the arid and semiarid conditions prevailing in South Africa. It is contended that the existence of such laws has in many

cases discouraged private individuals from utilizing the water passing through their lands for irrigation purposes. Land under irrigation, especially in the Karroo, where the soil and the climate are most excellent, commands very good prices. In the Oudtshoorn district land suitable for tobacco growing has been sold in one instance at the price of $3,400 per acre, which, however, is an abnormal figure. At Warrenton 90 acres of land irrigated by the Vaal River have realized $1,250 per acre and have earned from $400 to $750 per acre annually growing fruit and vegetables. As much as $750 profit has been derived from 1 acre of tomatoes in four months. In the vicinity of Graaf Reinet plots of land within the irrigated area are worth about $1,000 per morgen (2.11 acres). There are few parts of South Africa in which, when sufficient water for the crops is available and these are intelligently cultivated, the most abundant and profitable crops can not be grown. The soil in the areas susceptible of irrigation is extremely rich, and with the wonderful climate that the country enjoys water is the only thing required to build up most prosperous agricultural settlements in parts that are now in a semi-desert state.

SUNDAY RIVER SETTLEMENT PROJECT.

One of the largest irrigation projects now in process of construction in South Africa is that known as the Sunday River Settlement at Addo, 25 miles from Port Elizabeth. Sir Percy Fitzpatrick, one of the leading mining men of Johannesburg, originated the idea and he is now devoting most of his time and energy to the completion of the enterprise. The scheme is to catch the constantly recurring floods of the Sunday River and to distribute the water to the lands by the aid of canals. These floods last from three days to several weeks and come down from 6 to 12 times in ordinary years. The land to be irrigated is very rich, and citrus-fruit, vegetable, tobacco, and alfalfa growing, with dairying, pig raising, and the fattening of stock and poultry, form the chief industries for which these irrigated lands are intended. Blocks of from 10 to 40 acres will be sold to approved settlers, and the purpose is to attract time-expired men from the mines and railways, as well as farmers from the United Kingdom. It was calculated that in August, 1916, 8,000 acres would be under the furrows ready to be put under crops during the following spring; 2,000 acres are to be plowed and prepared for returned soldiers, who will not be required to make any payments for the land during the first five years if satisfactory security is given. The promoting company will undertake plowing, leveling, transport, fencing, dairying, curing bacon, sale of produce and stock, planting of orchards, establishment of alfalfa, and purchase of seeds, etc., whenever these things can be done at less cost than would be incurred by the individual settlers. This enterprise is looked upon as the testing of South African conditions in respect to closer settlement and the exclusive employment of white labor for farming work, and its success will unquestionably have a most important effect on the future of intensive agriculture in South Africa. The men behind this project are public-spirited and chiefly moved by the desire to ascertain and to demonstrate the capabilities of closer settlement of the land without Government assistance and of progressive methods of farming.

OTHER IMPORTANT IRRIGATION WORKS.

The Kaffirskraal Dam, in the Klerksdorp district, is one of the biggest undertakings of its kind in the southwestern Transvaal. Its full capacity is 200,000,000 cubic feet of water, the length of the earth embankment 2,700 feet, its greatest height 34 feet, and its greatest width at ground level 150 feet. The area of the water conserved will cover about 600 acres, and about 1,500 acres will be irrigated by it. Eighteen and one-half miles of canals have been built to carry the water from the dam to the lands to be irrigated. The cost is estimated at about $532,000. The largest irrigation undertaking in South Africa is being carried out by the Government along the Olifants River in the Van Rhynsdorp district, to irrigate more than 30,000 acres of land; this will cost over $2,500,000. A very large proportion of the irrigable land under this scheme belongs to the State and will be available for settlement. In the Breede River there are nine cooperative irrigation projects financed under the irrigation act, which have cost up to date $940,000. The Calitzdorp Dam, in the Oudtshoorn district, is a structure of concrete, 113 feet high, which, when completed, will cost $600,000. Local irrigation boards are generally responsible for enterprises of this character, the necessary moneys being advanced to them by the Government at 4 per cent interest and redeemable in 60 years. These boards are formed by the farmers who are to be benefited by such schemes, who collectively become responsible for the repayment of the funds advanced by the Government.

Other examples of large irrigation works in South Africa are afforded by the Van Wyks Dam in the Carnarvon district, with an area of 19 square miles and an average depth of 10 feet, holding when full 35,000,000,000 gallons of water. The Smartt Syndicate, in the Britstown district, has a dam 1,640 feet long at the crest, and its greatest height 60 feet. This will impound 4,000,000,000 cubic feet of water and will irrigate a very fertile and level tract of land 9,000 acres in extent, although the ultimate irrigable area is 25,000 acres. Considerable activity prevails in the Fish, Gamtoos, Olifants, Breede, and other rivers of the Cape Province along Robertson, Worcester, Colesberg, Clanwilliam, Cradock, Humansdorp, Oudtshoorn, Somerset East, and Swellendam. The Potchefstroom district in the Transvaal leads all the districts of that Province in the matter of irrigation. The census of 1911 shows this district as having 35,000 acres under irrigation, and undoubtedly this area has been largely increased since that time.

ACTIVITY OF IRRIGATION DEPARTMENT.

The irrigation department has from 70 to 80 drills actively engaged in water boring. These machines are rented to the farmers to bore for water in certain prescribed areas, where contractors are not available to undertake the work, at the rate of $20 per working day, and the services of the drills are in much demand for the provision of farm water supplies. The Government provides the machinery and experienced men to work it, while the fuel and water required for running the drills are supplied by the

farmers. During the financial year 1913–14, 609 bore holes, with an aggregate depth of 76,863 feet and yielding 7,972,300 gallons of water per day, were bored for farmers. There are said to be about 100 water-boring contractors in South Africa. In almost every instance where bore holes have been drilled success has attended the operations. In view of this, a vigorous policy is being pursued in connection with the development of vacant crown lands in Bechuanaland and the Kalahari, as it has been proved that these sparsely populated areas possess abundant supplies of underground water at a reasonable depth below the surface, giving promise that at no distant time these waste places will be able to sustain a relatively large number of farmers.

Irrigation by pumping is also steadily advancing, especially since the suction gas engine has proved successful when using charcoal as fuel. The plants generally in use range from 10 to 80 brake horsepower.

FARM LABOR AND CLOSE SETTLEMENT AS RELATED TO IRRIGATION.

The problem of farm labor in South Africa is one that must be considered when the matter of irrigation is approached. So long as the inefficient native is the only laborer to perform the various field operations, it will be in many cases an economic mistake to spend large sums of money in irrigation works. Irrigation increases the value of the land, because a large sum of money is spent to make it irrigable. Such high-priced land, therefore, must be very carefully and intelligently cultivated if an adequate return for the investment is to be obtained. It is doubtful whether with native labor the large crops necessary to derive a reasonable profit on the capital invested can be obtained. Wherever the native is to form the principal class of farm labor employed, irrigation (or any kind of farming requiring a large investment of capital) will be prejudiced. These conditions appear to be well understood in South Africa, and it is gratifying to see that whenever irrigation is discussed the subject of close settlement and white farm labor is at once associated with it. There is little doubt that after the war many returned soldiers and sailors—also many men who left South African farms, attracted by the good wages paid at the mines—will be settled on the land to farm in accordance with the modern principles of intensive cultivation of the soil. By declaring certain irrigated areas as exclusive white settlements, it should also be possible in course of time to give employment to the so-called "poor whites" as agricultural laborers, thus giving them a chance to become again useful members of the community.

The question of close settlement in South Africa will always go hand in hand with that of irrigation, for without irrigation there are few sections in the country where close settlement of the land can be satisfactorily undertaken. This matter of close settlement, like that of irrigation, is engaging the attention of many prominent men of South Africa, and great progress is being made in carrying out several projects of this nature. The African Realty Trust Co. is developing several close-settlement projects at this time. One of them is the Langholm estate, in the Bathurst district, which

is said to be admirably adapted for the growing of pineapples. A canning plant for pineapples is being erected, and an expert from Singapore has been engaged to manage it. Other properties are being developed by this company in the Cape, Natal, and Transvaal Provinces. In some cases ready-made farms already planted with citrus fruits, apples, sugar, tobacco, and other crops are offered to suitable settlers. Through subsidiary companies this concern intends to undertake the packing and exportation of the produce. It has recently opened an office in London for the purpose of calling attention to the advantages of its various estates. In the Orange Free State the idea of close settlement is also taking hold, even among Dutch farmers who in the past have been imbued with the idea that farming was not possible except when several thousand acres of land were available. The increasing practice in many districts, where for hundreds of years no crops have been grown with which to feed the stock in winter, of plowing a sufficiently large area for crops for the cattle, and also for a certain amount of maize for export, will no doubt lead to a reduction in the size of the farms, which will thus become better cultivated and make possible the settlement of a larger number of people on the land.

STATISTICS OF IRRIGATED LAND.

The following table shows the extent of land irrigated in the Union of South Africa, according to the 1911 census:

Provinces.	Total area under irrigation.	From constantly flowing streams.	From periodic streams.	From storage dams and wells.	Unspecified.	Length of furrows.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Yards.*
Cape Province	a592,970	299,499	195,066	97,769	636	13,935,760
Natal	39,209	32,999	3,702	2,423	85	993,676
Transvaal	238,888	180,276	22,327	39,956	329	6,896,351
Orange Free State	103,547	19,885	23,999	55,056	607	1,329,317
Total	974,614	532,659	245,094	195,204	1,657	23,155,104

a In 1904 the land under irrigation in Cape Province was only 408,660 acres, showing an increase of 40 per cent in seven years.

In connection with irrigation and the obtaining of water for stock and household purposes, there are 27,403 fountains and 42,012 dams in South Africa. There are also 16,992 wells for the same purpose, in connection with which 4,662 hand pumps, 3,775 windmills, 89 steam engines, and 114 internal-combustion engines are used, and 14,602 bore holes, in which 1,967 hand pumps, 7,812 windmills, 53 steam engines, and 330 internal-combustion engines are in operation.

SOILS.

The best soils of South Africa are found in those parts of the country where the rainfall is so inadequate that crops can not be grown without irrigation. The soils of the well-watered sections of South Africa can not, generally speaking, be termed rich in plant food and humus. Owing to the variety of soils existing in South

Africa, the different types found within comparatively small areas, and the absence of well-defined areas possessing characteristic types of soil, information as to the prevalent soils in the country is difficult to convey. As a general rule, South African soils are not rich in the total amount of salts and plant food required by the crops, and they are also deficient in lime and phosphates. These chemicals have to be added to the soil in the form of artificial fertilizers to make the land productive. The soils in the southwestern districts are among those in which this deficiency is most often observed. Wheat could not be grown in the Malmesbury district and adjacent areas, where the soil is chiefly a loamy clay, without the aid of superphosphates or guano. Abundant crops are obtained in South Africa, however, in sections where the soils appear to be extremely deficient in plant food. This is attributable to the favoring influence of the abundant sunshine and the high temperature experienced in South Africa. Soils poor in available salts, under these conditions, give the plants greater nutriment than soils containing a considerably larger percentage of salts under climatic conditions less favorable. In considering the fertility of South African soils, therefore, these features must be held in view, as their influence on the productivity of the soil is very marked. The remarks concerning the deficiency of salts in the South African soils must not be taken to indicate that those soils are, as a rule, poorer than the soils in other countries. They probably compare very favorably, on the whole, and the amount of nitrogen they contain is admitted to be quite high.

Black turfs, red clay, sandy soils, and loamy soils both red and gray, with an admixture of sand, are often encountered and are considered among the best soils for maize. These are found largely in Transvaal Province, and particularly in Heidelberg, Standerton, Bethal, Ermelo, and Lichtenburg districts. Deep loamy alluvial river-bottom soils are found along most Transvaal rivers and streams. Heavy brown loam is a type of soil very common in Transvaal and Natal Provinces and in Rhodesia. Rich soils are also found in pockets along the foot of the eastern slopes of the Drakensberg Mountains, but only a short distance out on the plains beyond there occur strips of ashy gray soil which seem unsuited to almost any crop; along the Orange River and in many parts of northwestern Cape Province the soil is very rich and, with the excellent climate prevailing there, invites comparison with the famous lands of Egypt. With irrigation or an adequate rainfall the land could yield wonderful crops of anything. The soils of Natal might be considered as above the South African average in contents of humus and general richness. This is chiefly the case along the coast, where sugar cane is extensively cultivated. Gray and black alluvial soils, sandy gray and red light loams, also chocolate loams and sandy clays, are types of soil often observed in South Africa.

The Karroo soil is usually a red, sandy clay, which, as it is washed away by thunderstorms (so frequent in that region), is deposited in the valleys below in the form of a stiff, red clay silt, which is extremely fertile. Many farmers, the Dutch in particular, are very partial to the "Vlei" soils in selecting land to be put under crops. These correspond to our "gumbo" soils, which in South Africa are often found with a good growth of quick grass. In the aggregate

there is a large area of this gumbo soil under cultivation; it is most difficult to handle, and a heavy single-furrow moldboard plow, with a strong fore-carriage, is used instead of the two-furrow moldboard plow, which may be regarded as the standard type of plow used in South Africa.

As regards the physical condition of South African soils in connection with agricultural operations, it will be noted when the subject of plows and plowing is discussed that the science of plowing has not yet reached the stage when special shapes of moldboards are demanded by the farmers to plow soils of different types and in different conditions. It may be repeated here that after the maize, which is the staple crop of South Africa, has been harvested the rains practically cease, and a long period of dryness is experienced; and, since the spring rains may come too late to allow sufficient time to prepare the land for the next crop, it is often necessary and indispensable to plow the land during the winter, when the soil is very hard and dry. The favorable weather usually prevailing after the maize has matured also tends to make the harvesting of this crop a very protracted operation, with the result that plowing is not started soon enough to benefit by the moisture remaining in the soil during the early autumn. The ground becomes still harder and drier as the result of intense evaporation and the dryness of the atmosphere during the winter. The practice that still prevails in many parts of South Africa of burning the grass every winter also accounts to a certain extent for the unsatisfactory physical condition of most South African soils. Where this is done, the soil is laid bare to the sun, and when precipitation takes place there is nothing to retard the flow of the water, which runs unhindered to the next watercourse, going to waste and carrying with it, if the soil is sandy, an immense amount of soil. This also causes the soil to become either of the hard consistency of a brick or pulverized by the heat into a powder, the particles of which are so fine that the water can not penetrate into it.

The topography of South Africa demands consideration also when soils are discussed. As has been shown, South Africa is a high table-land or plateau, with a rapid descent on all sides to the level of the sea; consequently all waterways, streams, and rivers have a rapid descent from the high table-lands, and although on the highest part of the table-land, the Transvaal, the rainfall is between 30 and 40 inches, the fact that it falls chiefly during a few months and usually descends with great rapidity to the sea causes a condition of more or less drought to prevail for the greater part of the year. As a result the soil is left in a baked condition and, worse still, subject to the scorching heat and dry winds and dust storms, causing much of the soil to be carried away to the sea when the rains fall. All this leads to an enormous wastage, erosion, and loss of soil, and this must certainly cause the lack of humus observable in South African soils, since such vegetable matter as has mixed with the soil during the growing season is mostly washed away when the rains come.

SIZE OF FARMS.

In the early days the farms of South Africa were of very large size, and holdings of more than 25,000 acres were not uncommon. The partition of farms among the male members of the generally large

families has brought about in many cases a substantial reduction in the size of the farms. Some of the sheep and cattle runs in the northwest of Cape Province, parts of the Karroo, the western sections of the Orange Free State, and the west and north of Transvaal Province are still very large, for the reason that from time to time settlers from these sections have sold their land to their neighbors—either to retire from that branch of activity or in order to take up land in the more favored sections of the Union. It is quite common to find farms of 12,000 and 15,000 acres in those sections of the country. In the best districts of the Transvaal and Orange Free State the farms are still of 2,000 to 5,000 acres, but these are being gradually subdivided as the demand for good arable land increases.

The parts of South Africa with the smallest farms, where to some extent close-settlement conditions prevail, are in the southwestern region of Cape Province, where, in the districts of Paarl, Stellenbosch, Cape, and Tulbagh, the average size of the cultivated farms is probably under 200 acres. In the other districts of that region, where wheat is extensively grown, the farms may average about 500 acres, and in the eastern end of Cape Province the farms are also relatively small, although large farms are still found among them. In Oudtshoorn, the famous ostrich farms are small in size, and, generally speaking, this is also the case wherever irrigation schemes have enhanced the value of the land. Along the Natal coast the farms are also small in size. There is assuredly a tendency to subdivide the farms everywhere. In a few cases when a syndicate intends to put land under irrigation the land is bought from the various individual farmers contiguous to the area where the water dam is to be built, but when the works have been completed these farms are again sold in small plots and the farms become much smaller than before the irrigation works were constructed. Information is given elsewhere as to the effects of close settlement and irrigation, one of which is invariably to reduce the size of the farms. Farmers are beginning to understand that it will pay them better to cultivate properly a small farm than to attempt the cropping of large areas of ground, and many farmers have in recent years sold portions of their farms, attracted by the good prices they have been offered and also induced to do so by the realization that they had more land than they were able adequately to cultivate and use. This subdivision of farm holdings is certain to continue, and the growing desire for a law to tax the land is due to an appreciation of the abuses that such a law would prevent, chief among these being the locking up of large tracts of land by private companies in the Transvaal which have purchased large blocks of land, confident that there will be a strong demand for it in the next few years at much enhanced values. The desire to bring about a change of attitude on the part of the large landholder who still devotes good agricultural land to pastures is another reason behind this movement.

GENERAL ASPECTS OF SOUTH AFRICAN FARMING LIFE.

The farming industry of South Africa has not yet reached the stage where uniformity of agricultural practice has been established as a result of the coordination of the settlers' ideas and methods. Every farm possesses characteristics of its own as regards its layout, man-

agement, and methods of cultivation. In other words, education and agricultural research have not yet established popular standards making for the adoption of uniform methods in the various phases of farm life.

As has been pointed out, the farms of South Africa are often of large size, but the chief differences are noted between farms with a large acreage under cultivation and those in which pastoral farming is still the predominant industry.

As a rule, farms with a good deal of cultivated land can be said to begin being subdivided as soon as the sons of the owner become of sufficient age to undertake the responsibility of supervising the work of a certain portion of the farm; separate dwellings for such members of the family are built for them close to the lands that have been intrusted to their care. This is done chiefly with the idea of saving time in going to and from such lands. Instead, therefore, of the owner's residence being of a size commensurate with the importance of his operations a number of small dwellings are seen in its place, scattered over the property. This is also the case when a large farmer has to employ outside foremen. The result is that only in a few cases, and in connection with certain operations, is it possible to appreciate the amount of work that an owner is doing on his property. Although comfortable, the dwellings for the members of the household are usually very unpretentious and simple in their arrangements, and this is also true of the other buildings, such as warehouses, barns, etc.; it may be largely due to the excessive cost of building materials in a country like South Africa, where all the materials for dwellings along modern lines must be imported from overseas. The natives employed on such farms live in their own kraals adjacent to the owner's homestead.

Large pieces of land under a crop are seldom seen. Owing to the abundance of land, only the choicest spots and those more easily workable are selected. A farmer may have as much as 800 or 1,000 acres under maize, but this might be grown in 10 or 15 separate sections. Another characteristic is that a farmer will generally devote his land to but one or two different crops. He may have a large acreage under maize and another section of his land under alfalfa, or another crop, and, with the exception of a sufficient supply of vegetables for his own needs, he will not grow anything else. In all cases he will have a certain number of cattle and of sheep, when his lands are suitable for live stock. In the areas where ostriches do well, a number of these will almost invariably be kept, as they require little attention.

Only in cases where the farm is located near creameries is dairying practiced at all, and pig breeding and poultry raising are still a specialty with some farmers and are not very generally practiced. There is now developing a tendency toward more diversified farming, which is assisted by the increasing number of creameries that are being established all over the country, as well as the better facilities for marketing such products as the farmer may raise on a smaller scale.

The various farm machines are taken from one section of the farm to another as they are required, but in the case of plows and harrows every section of the farm may have its own separate tools.

As has been said elsewhere, practically all the manual labor is performed by the natives, who are often left to do the work in the manner they deem best. It is a rare occurrence to see the owner of the farm or his foremen or any white person do such operations as plowing, harrowing, planting, and harvesting. The fact that all labor is left for the natives to do is responsible in the main for the slow progress made in adopting efficient methods of farming, because of the owners' lack of familiarity with the actual practical work of a farm. To this condition must also be attributed the relatively high cost of farming in South Africa, since no standards have been established as to the work that the laborers or the machines should perform in a given period of time. The work is also done improperly, owing to the absence of adequate supervision of the natives, and this is undoubtedly another deterring cause.

These are, it is felt, the ordinary conditions prevailing in most South African farms, but there is assuredly a movement toward an improvement in all these aspects of farming life. In the Transvaal, and in other parts of South Africa, there is a constantly growing number of progressive farmers who take the most intense interest in all phases of the work done on their properties and who closely supervise the work of their laborers and teach them how to do more and better work.

Among the backward farmers, chiefly those who limit their activities to stock raising, farming life is apparently devoid of interest. The dwellings are most primitive, often consisting of a single room, where the various members of the large families eat and sleep and live continuously. Such farmers leave everything connected with the farm to their natives.

BARNS AND SHELTER FOR IMPLEMENTS.

There is almost an entire absence of barns on South African farms for the sheltering of grain and implements. The grain is sold soon after the harvest is over, to either the cooperative societies or the local dealers, and whenever any grain is held over this is generally left upon platforms raised above the ground and covered with sail cloth. In the great majority of cases the implements are left on the lands where they were last worked, and, when they are put under cover, this is not done in a satisfactory way. A farm was visited by the writer that was supposed to be representative of the progressive type, and so it actually was in many ways. The machines were kept in a barn with a galvanized-iron roof (the regular type of roof in South Africa), but this barn was uncovered at the front, so that dust and wind had free access to it. There were about 20 machines of various kinds in that barn, all with a thick dust covering, and so far as could be seen not one machine among them was complete. Such parts as bolts, nuts, grease cups, and others of which general use can be made are indiscriminately taken out from complete machines if they are required for other machines. This accounts for the small service that is often obtained from good machinery.

At one of the agricultural shows the writer had an amusing experience. He was conversing with the gentleman in charge of the exhibit of a well-known machinery importer when a farmer came up and stated that a plow which he had purchased from that firm

had proved the most satisfactory he ever had and that for this reason he wanted another one like it, because the plow that he had had already done its work. He was asked how long ago he had purchased this plow, and from his answer it was learned that he had bought it three years previously. This type of plow was constructed almost entirely of steel and was as strong and well made a plow as has ever been sold in South Africa, and still the farmer was satisfied with the three years' service it had given him. In the hands of a careful farmer it should have been good for nearly a lifetime.

The local dealers' example is not conducive to the farmer's protecting and keeping his implements properly. As a general rule the country storekeepers have an assortment of the machines they sell either in front of their establishments in the open or at an adjoining yard, where wind, rain, and sunshine unceasingly play havoc with them—to such an extent that they are far from being in a satisfactory condition when they are sold to the farmer.

Cases are also frequent in which the farmer receives machines wrongly set up, which fact may perhaps not be discovered until some irreparable damage has been done to them (in most cases without the farmer being able to realize it).

In view of the little care that is given to farm machinery and the unsatisfactory labor in whose charge it is put, it is questionable whether there is another country where the farmers get less service from their machinery than is the case in South Africa. The native, when properly coached and instructed, is not a bad mechanic and is happy in the handling of a good tool, but unless he is closely supervised he is the most wasteful worker imaginable. It is stated that when he has once operated a machine that he liked and afterwards works for another farmer using a different type of machine, he will destroy the utility of that machine until the farmer is compelled to acquire such a machine as has taken the fancy of the native. In some cases he is unreliable to the extent of willfully breaking parts of the machine in order to remain idle until parts to replace those broken have been obtained.

AGRICULTURAL LABOR.

NATIVES.

Strange as it may seem, less than 7 per cent of the native population of South Africa is employed as farm laborers, and, despite the relatively small number of farm holders, the scarcity of labor is one of the chief factors retarding the agricultural development of the country. This shortage has been most acutely felt since the development of the mining industry, for, although labor on the land is preferred by the natives to any other, the high wages paid at the mines have attracted them in increasing numbers. The strongest causes that draw the natives from their locations to seek work are probably the desire to obtain money to purchase wives and the laws of various Provinces which compel the natives to pay hut taxes. The adult native male is subject to a yearly hut tax, varying from $0.75 to $10 per capita, with, at times, an additional sum for every wife after the first. This tax must be paid in coin. Considering the large number of natives in South Africa it will be seen that they are

the taxpayers of the country to a much greater extent than is generally realized. They pay in direct taxation as much, at least, as the farmers do, and they are indirectly taxed by a customs duty of 25 per cent assessed on the importation of such articles as they are supposed to use. Aside from the inducements referred to, there is very little reason, from the standpoint of the natives, why they should work. It is hardly to be expected that the descendants of a race that for ages have been able to select the most fertile spots of a country abounding in game—living under a sky that reduces to a minimum the need of shelter and clothing—will easily develop habits of steady industry. The visitor to a Kaffir kraal can not fail to notice how little influence the white man's mode of life has so far had on the native surroundings, and how capable the natives are of providing for their limited comforts and wants. Throughout South Africa a minimum of labor suffices to maintain the natives in plenty, and except when a failure of crops occurs only a small number of them will offer themselves for work. Family responsibilities hardly count at all, as the land is nearly always held on the communistic principle, and, while wealth is nearly impossible, real poverty is unknown among the natives.

Certain schemes have been devised to remove the reluctance of the natives to offer themselves for work. Legislation has been enacted in certain Provinces that obliges all adult natives of certain reserves to labor for three months every year outside their district or in default to pay an additional tax. Another scheme is to employ the authority of the native chiefs, who, generally speaking, are not averse to compelling their subjects to work when any benefit accrues to themselves. With the disappearance of the power of the chiefs over the lives and goods of the natives, their influence in this respect will, doubtless, gradually wane. The rapid increase in the numbers of the natives, who clearly overcrowd some locations and reserves, may account for most of the labor now obtainable, and this circumstance will also provide the source of the labor required for the future expansion of South African farming. In a few cases education has led the natives to habits of industry, and in others it has fostered the desire to procure the means of acquiring necessities and comforts—a desire created by the knowledge of better conditions. The tendency to frame laws whereby any native seeking employment must contract for a certain definite period of time may also improve the situation. As matters stand at present, there is nearly always a great deal of uncertainty with respect to the securing of adequate labor supplies and the keeping of the laborers long enough to be of any practical benefit. Farmers are often confronted with the danger that at the approach of the growing season, or when the crops are ready to harvest, the natives may decide to return to their locations, leaving the proprietors entirely helpless to prosecute or finish the work in hand. In the wheat-growing districts in the southwestern part of Cape Province, where the "colored" population is in greater evidence, these unfavorable labor conditions do not prevail to the same extent, as social customs approaching those of Europe and similar countries are gradually growing up. The colored natives known as "Cape boys" are a much better type of worker than the raw natives. In the Orange Free State little difficulty is experienced in obtaining labor and in keeping it for a reasonable length of time.

RATE OF WAGES AND BASIS OF EMPLOYMENT.

The rate of wages paid to native farm laborers varies greatly in different districts, but, speaking generally, it ranges from $2.50 to $10 per month, with food, in the Cape Province, the Orange Free State, and Natal, and considerably more in some parts of the Transvaal, because of the proximity of the latter to the mines, where the natives earn much higher wages. A certain amount of labor is at times given by natives without payment, or for a very small payment, in return for the privilege of living on the farm, cultivating a certain portion of the land, and keeping a certain number of stock. This system commends itself to farmers having land that has not been fully occupied, but it will probably be discontinued as the land becomes more valuable and fully utilized by the farmers. In some parts of South Africa natives were being employed in increasing numbers a few years ago to work for white farmers on shares, and this arrangement seemed to work well for both the farmer and the native, the latter showing much more industry when he had a substantial objective and inducement before him. This naturally led other natives to prefer this basis of employment, and the practice increased to a point where certain farmers experienced difficulty in securing the labor they required, with the result that they exerted their influence to have a law passed in 1913 making it illegal to contract with natives for farm work on shares.

VARIED OPINIONS CONCERNING USEFULNESS OF NATIVE LABOR.

There is much difference of opinion concerning the usefulness of the native as a farm laborer. The kind of labor that he ordinarily produces is considered extremely inefficient in the great majority of cases. He proves not only lazy and indifferent, but careless and consciously wasteful as well. It is natural that such should be the case, for he often receives scant encouragement and inducement to be otherwise. There are some farmers, on the other hand, who have succeeded in commanding both the respect and the loyalty of their natives and who are perfectly satisfied that, given proper working conditions, the native is both a useful and profitable asset in South African agriculture. The most noted agriculturist of Natal, a man whose dairies are found in the principal cities of Natal and Transvaal Provinces, has a farm devoted to the rearing of calves on the most scientific methods known. On that farm all the work is done by natives, not a single white man being employed there. One of the largest Durban firms importing farm machinery employs natives for setting up the machines as received from overseas before shipping them to the interior, and its manager states that their work leaves nothing to be desired as regards the conscientiousness, ability, and expedition with which it is performed. White laborers, in his opinion, could hardly be expected to do that work better or more quickly.

As will be seen, the general conditions with respect to the use of native labor in South African farming at the present time could hardly be more unsatisfactory. If, in spite of this, farming in general has progressed, there is reason to expect a material improvement in agriculture as the outcome of the ameliorated labor conditions that are certain to obtain in the future.

EDUCATIONAL OPPORTUNITIES FOR NATIVES.

A fact of no small importance in connection with the native races of South Africa is the establishment of the South African Native College at Fort Hare, near Alice. This has been promoted for the purpose of providing higher education and training in arts, science, agriculture, and commerce, and with the primary object of giving efficient and uniform training to native teachers. It is noteworthy that the natives themselves have contributed substantially to the funds necessary for this undertaking. The Transkeian General Council has for some years contributed at the rate of $10,000 per annum and has recently provided $50,000. The Basuto Council has contributed $10,000. Moneys have been contributed by various churches, and the Union Government contributed during 1915 the sum of $3,000. It is affirmed that during the past few years 500 South African natives have gone to America to train at the higher educational institutions for colored people that have been established there.

Special attention is to be given by this college to agricultural education, both theoretical and practical—a branch of study the economic importance of which can not be exaggerated. The native is notoriously the most wasteful agriculturist in the world, and competent authorities have estimated that under reasonably economical methods of agriculture the Transkeian territories to-day could support five or six times their present population. In some respects the natives, in matters of education, are outdistancing the white people, at least in certain sections of the country. The Superintendent of General Education, in his report for the year ended September 30, 1914, states that there was an increase of 125 schools, of which 50 were for Europeans against 75 for non-Europeans. The total enrollment comprises 102,665 white pupils, against 138,471 colored, an increase of 5,890 whites against 12,159 colored.

EAST INDIANS.

In Natal (for many years a purely British colony and the best-watered section of South Africa), notwithstanding the fact that its native population outnumbers the white 10 to 1, the cultivation of sugar cane, tea, and other crops requiring careful tillage and unremitting attention was seriously jeopardized until Indians were imported into the colony. The number of Asiatics in 1911 was estimated at 122,000, and these, for the most part, were employed by white planters. Attempts have been made to encourage Indians to become farmers on their own account, but this has been strongly opposed by the white growers, as they fear that the success of the Indian in that capacity would, in a short time, deprive them of the Indian labor. The Indian, given favorable treatment and encouragement, makes a good farmer—far superior to the native in the growing of sugar cane and other crops requiring careful and intensive cultivation. In some cases white farmers have given Indians a piece of land as payment for their labor, and the latter have proved that they can easily become proficient agriculturists. Returns of more than $200 per acre per annum have been quite frequently obtained by Indians working on their own account. It is estimated that Indians are at present cultivating about 3,000 acres of sugar

cane on their own responsibility. The wages paid to Indian farm laborers vary from $5 to $15 per month.

WHITES.

White labor so far has been used hardly at all in South Africa for agricultural purposes, but there are indications that this condition is tending to pass away. As a matter of fact, there are a large number of white men in South Africa who would be far better off if they were encouraged to become farm laborers. It is estimated that the class of people called in South Africa "poor whites" numbers about 45,000—besides those who may have reached that condition as a consequence of the last drought. The problems connected with the indigent condition of the poor white population of the country are among the most difficult and acute for South Africa to solve, and agriculture has lately been looked upon as the industry that, in the main, may facilitate the rescue of these people from their deplorable situation.

GOVERNMENTAL EFFORTS TO AMELIORATE CONDITIONS.

The Government has been exceedingly preoccupied with this problem, owing to its increasing dimensions and the apparent inability to devise means to solve it except in a slow and cautious way. So far, however, the Government has placed about 10,000 of these people in the railway service, in road making, and in other engineering work, as construction laborers, paying them much higher wages than would be paid if natives were employed. They are gradually being led into habits of industry and self-reliance, and are being helped to fit themselves for more congenial and profitable occupations. One thousand of these men have already ceased to be laborers and have become employees of the railway department, where all grades are open to them, so that some aspire to become station masters (one or two have actually succeeded), and more of them to become foremen. Their children are educated in railway schools, and when the men themselves are employed in the cities as carriage cleaners, etc., they are induced to attend night schools.

A large number of them, showing the possibility of becoming good farmers, have been established in farm colonies maintained by the Government. In the Kakamas Labor Colony 5,000 acres of land have been put under irrigation, and 3,000 of these people, including their families, are kept there. In the Bucklands Estate a dam containing water to irrigate 800 acres is being enlarged to irrigate 3,000 acres, and all the work there is done by whites. In the southwestern part of Natal 4,000 acres of land are entirely worked by these men. Before these "poor whites" can become farm laborers they usually need to be taken in hand by the Government and prepared for that class of work. A bureau of white labor is maintained by the Government that is promoting the employment of white laborers on private farms, and several hundred of these men have been placed. The Government provides free transportation for farm laborers proceeding to farm work. Encouragement is given by promising to settle them on the land on their own account when they give proof of their ability to work it intelligently. In other words, they pass through a probationary period either on the railway or on the land, with generous assistance for those who show themselves

able to take advantage of it. Of the men so far placed on private farms, 90 per cent are said to have made good, and after they have learned their craft and acquired the habit of work they have shown a disposition to become dependable and prosperous workers. There is little doubt that white labor will be employed more generally on the land than it is at present, but any movement in this direction will probably be more gradual than has been the case in connection with the railway and engineering works, where the laborers, as a rule, work in gangs. The so-called "poor whites," when they start work, lack all ideas of farming and require such supervision as can not well be given often in farm work. They also lack at that time the moral fiber to begin and cease work at the proper time. These difficulties have to be overcome before the "poor whites" will become fitted for agricultural work in large numbers.

A difficulty in the way of poor white men taking up a piece of land and developing it without native labor is that whereas in other countries a white man may take up some land for farming and be willing to do some other work in the off season if he lacks capital or until his way is clear, in South Africa he is in competition with the native, whom tradition has given a practically exclusive title to all the manual labor. The black man, so to speak, has usurped the right of the white man to work and has thus been instrumental in rendering him unfitted for work of any description. It can be seen, therefore, that unless the white farmer has means to fall back upon and to sustain him for the first year or two until the land is able to support him, he will find it almost impossible to aspire to become a farmer.

Among certain classes of the farming population of South Africa a movement has sprung up to have the Government make it possible for the "poor whites" to take up a piece of land and work it for their own account. This is not likely to prove successful. They must first go to work for others, and as they show the requisite competence and self-reliance the time will then be more favorable for giving them facilities to become independent farmers. Otherwise, at the slightest difficulty, they relapse into their original condition, after money and patience have been exhausted and the land, quite possibly, has been ruined.

NUMBER OF PERSONS ENGAGED IN AGRICULTURE AND RELATED ACTIVITIES.

According to the census of 1911, the following persons were in possession, working, and cultivating land, raising or dealing in animals, or following pursuits subsidiary thereto in South Africa:

Divisions.	European or white.		South African natives.		Other colored persons.		Total.
	Male.	Female.	Male.	Female.	Male.	Female.	
Cape Province	61,758	14,081	55,829	19,140	42,480	7,765	201,053
Bechuanaland	2,619	325	2,870	475	1,197	226	7,712
Transkeian Territories	2,606	892	7,190	2,903	583	277	14,451
Natal	6,567	2,257	32,692	9,052	18,771	5,972	75,311
Zululand	377	95	3,266	489	847	440	5,514
Transvaal	36,357	8,809	57,877	19,691	2,922	776	126,432
Orange Free State	30,153	9,526	52,925	25,065	3,348	1,502	122,519
Total	140,437	35,985	212,649	76,815	70,148	16,958	552,992

AGRICULTURAL EDUCATION.

Four schools of agriculture and several experiment stations serve in the main to educate the rising generations of South African agriculturists. In 1914–15 the appropriation for agricultural education amounted to nearly $600,000, but owing to reduced expenditures made necessary by the war, that for the following fiscal year was reduced to $365,000. The importance that the Union attaches to the education of the farming community can be discerned from these figures. In the following schools horticulture, poultry raising, husbandry, cropping, and stock farming are taught, besides the special features indicated:

Elsenburg, Cape Province.—The oldest of the schools is situated about 30 miles from Cape Town. Area of grounds, 1,700 acres. Special features of this school are horticulture, viticulture, cereals, and Turkish tobacco.

Grootfontein, Cape Province.—Outside the town of Middleburg. Area of lands, 27,000 acres. Special features are agriculture with irrigation under Karroo conditions, ostriches, merino sheep, and angora goats.

Potchefstroom, Transvaal.—About 83 miles southwest of Johannesburg. Special features of the instruction are agriculture under highland conditions, cultivation of crops under irrigation and otherwise, cattle, maize and other cereals.

Cedara, Natal.—Fourteen miles to the north of Pietermaritzburg. Area of lands, 3,600 acres. Special features are subtropical agriculture, forestry, wattle growing, cattle, and maize.

In the Orange Free State no similar institution is in actual operation at present, but one such establishment at Glen, near Bloemfontein, will be ready to receive students within a short time. More than $200,000 is being spent at present on the erection of the necessary buildings there, which are rapidly nearing completion.

COURSES OF INSTRUCTION.

Courses of instruction of one, two, or three years are given. The one-year course is intended to meet the requirements of those who have had some farming experience and of those who desire to obtain an insight into practical working and up-to-date methods. Science subjects are, however, largely omitted. Students are afforded, in particular, an opportunity of becoming conversant with the operation of agricultural implements not generally met with in ordinary farming practice. The two-year course is similar to the one-year course, and in addition agricultural chemistry, geology, botany, zoology, and entomology are dealt with. In this course the time devoted to class and to practical work is almost equal. On satisfactory completion of the course students are awarded the "diploma" of the school, and any subject passed with sufficient credit is marked "with distinction." The three-year course is for students who have been awarded the "diploma" of the school and desire to continue their studies. Advanced studies can be taken on particular subjects, such as agriculture, horticulture, and viticulture and wine making.

To foster the dairy industry a special course in dairying is given at the Grootfontein College, and on the completion of the course,

which extends over six months, students, in order to qualify for the certificate in dairying, must gain practical experience at an approved butter and cheese factory. This special course, together with factory experience, is intended as a suitable training for those desirous of qualifying for positions of responsibility in dairies.

At all the schools of agriculture short courses in the practice and science of agriculture are given during the winter (June to August), and are mainly for young farmers and farmers' sons. The courses are also arranged so as to be useful to teachers of agricultural subjects in rural schools, and the attendance of women is encouraged for instruction in suitable subjects. These courses are divided into two periods of 14 days each. The lecturers at the schools and sometimes the chiefs and technical officers of the various divisions of the department of agriculture give instruction at these courses in connection with the subjects selected.

FEES AND COST OF MAINTENANCE.

The fees are $250 per annum for the one, two, and three year courses, $125 for the six-months dairy course, and $12.50 for each period of a fortnight of the short vacation courses. With the present basis of attendance, the Government's expense in maintaining these colleges is probably $500 per student annually, after all items of income have been considered.

WORK OUTSIDE OF CLASSROOMS.

The staffs of these colleges, in addition to their work therein, advise and instruct farmers in respect to various phases of agriculture by means of correspondence, publications in the press, and lectures and demonstrations given at different centers as circumstances permit. Monthly notes are sent to the agricultural press on the progress of each institution and the results of the work performed. Experiments in crops and manures are conducted at the schools and experimental stations and in cooperation with farmers. Analyses of agricultural materials and dairy products are undertaken, as well as the testing of seeds and identification of plants and insects. A certain amount of pure-bred stock is annually offered for sale at public auction by the various schools, and approved varieties of seed are also disposed of to the public.

SCHOLARSHIPS.

At the four schools of agriculture the Government gives annually a number of bursaries, tenable for two years and held by approved students whose parents or guardians are not in a position to pay the full school fees. Also, under the ordinary conditions, a certain number of valuable scholarships ($750 per annum) are offered each year for special students overseas in live stock and agricultural subjects, or in some other branch of agricultural science. These scholarships, which are ordinarily available for two years, are granted to students who have completed a brilliant course at one of the schools of agriculture, or to others who are graduates of the Cape University

in science or otherwise worthy of a scholarship. The holders of these scholarships, on their return, are to enter the Government service for a specified period. For the year ended March 31, 1914, the sum of $21,460 was expended in connection with these scholarships. Nearly one-half the holders of them are studying in colleges in the United States, and 21 other persons from South Africa were taking courses in 1914 in foreign colleges of agriculture without any Government assistance.

ATTENDANCE.

The attendance at these schools of agriculture in recent years has been as follows:

Schools.	1914	1915	1916
Elsenburg	24	13	23
Grootfontein	79	41	60
Cedara	31	27	7
Potchefstroom	68	23	41
Total	202	104	131

A certain amount of instruction in the elements of animal and field husbandry, botany, etc., is given in the primary schools, and the Native Affairs Department has also established agricultural institutions in various parts of the native territories.

The entire agricultural education scheme is in charge of one of the two undersecretaries of agriculture, and there is no question that the work of the Government in this connection is carried along and fostered with both intelligence and enterprise. The farming community thus far has not given altogether adequate support to the admirable facilities for agricultural education.

LOANING OF BOOKS TO FARMERS—AGRICULTURAL PUBLICATIONS.

One of the latest schemes of the Department of Agriculture to advance the study of agricultural science is to loan to the farmers of the Union the books of its extensive library. These are loaned free of cost and forwarded and returned without expense to the farmers. The books available for circulation in this manner comprise a great variety of agricultural subjects, and they are classified as "elementary" or "advanced" to provide for the class of education or information that it may be desired to obtain.

Before the outbreak of the war the Government published "The Agricultural Journal of South Africa," a monthly magazine printed in both English and Dutch editions, the circulation being 24,500 copies of the former and 9,500 copies of the latter. This journal was distributed free of charge to the bona fide farmers, and approximately one-half of the cost of printing was derived from the advertising charges. It is not clear whether, when the war is over, the publication of this journal will be resumed. The privately owned agricultural press of South Africa is making good headway and proving most efficacious.

USE OF FERTILIZERS.

One of the chief obstacles hitherto in connection with the use of commercial fertilizers in the interior Provinces of South Africa has been their expensiveness, due to the high cost of transportation inland. Since South African soils, as has been shown elsewhere, are not generally very fertile, a more extended use of fertilizers would assuredly result in much greater yields than have been obtained so far. Commercial fertilizers are being used to an increasing extent, as is indicated by the following figures, showing the value of imports during recent years: 1907, $169,568; 1911, $499,906; 1912, $605,932; 1915, $853,273. The imports in 1915 were composed of the following classes of fertilizers: Basic slag, $102,338; bone manures, $42,708; guano, $13,865; potash manures, $3,270; sulphate of ammonia, $3,835; superphosphates, $536,011; all others, $151,246. It will be seen that the superphosphates formed the bulk of the commercial manures imported. This type of fertilizer is extensively used in connection with wheat and maize growing. All progressive farmers at present use superphosphates to a greater or less extent.

During the year 1914, 8,133 tons of guano were obtained from the Guano Islands on the west coast of South Africa, which are the property of the Union Government. This guano is the excretion of sea birds and is said to be of finest quality. The analytical composition shows it to be composed as follows: Nitrogen, 11.63 per cent; potash, 2.87 per cent; phosphoric oxide soluble in water, 3.82 per cent; phosphoric oxide soluble in citrate solution, 9.12 per cent; total phosphoric acid, 10.24 per cent; lime, 9.86 per cent. When a substantial supply of this guano is available for sale the Government invites applications from farmers for the purchase of it; the orders received have always been four or five times greater than the amount available for allotment. The grain farmers of the southwestern districts of the Cape Province, who are acquainted with the good qualities of this guano for their soils, are particularly eager to obtain large supplies, and nearly 85 per cent of the guano produced is purchased by them.

This guano in 1915 was sold at $37.50 per ton of 2,000 pounds, bringing an income of a little more than $300,000, to which must be added about $40,000 as proceeds of the sale of penguin eggs, sealskins, and seal oil. The cost of obtaining the guano and these by-products is about $150,000 per annum. The production of guano in recent years has been as follows: 1911, 4,647 tons; 1912, 6,372 tons: 1913, 7,441 tons; 1914, 8,133 tons.

Works designed to increase the breeding area have recently been constructed and are expected to result in much larger yields of guano. Owing to the size of the farms and the sparseness of the white population, the amount of stable manure produced is not sufficient to permit of its use on a large scale, and the comparatively small amount available on most South African farms is chiefly utilized in growing auxiliary crops such as potatoes and vegetables, root crops, etc. Farmers have generally attached little importance to stable and stock manures, but more interest in making good use of them has been observed of late. There seems to be every probability that the private manufacture of sulphate will be undertaken at an early date.

DRY-LAND FARMING.

The question of dry-land farming is being discussed in South Africa at present with a great divergence of opinion. It is contended on the one side that the prevalent dryness of the winters, absence of snow, and great evaporation make dry farming in South Africa a different undertaking from what it is in America. On the other hand, the advocates of dry farming claim that with a more thorough preparation and cultivation of the soil, together with the careful selection of drought-resisting varieties of seed, the area of South Africa that, so far, has been considered capable of sustaining crops could be largely increased. This view appears to be gaining in favor, and there is no question that if these principles were extensively applied much better crops would be harvested than has hitherto been the case. One can reasonably look forward to the popularization of the dry-farming practice in South Africa, since the results that many farmers have already obtained have been very satisfactory. Exhaustive experiments have been conducted by the Department of Agriculture with better methods of soil cultivation to ascertain how moisture can be best conserved to grow and mature crops, and many farmers throughout the dry sections of the Union have found that the application of the methods pursued in these experiments has enabled them to reap more profitable harvests on their own farms. The conservation of soil moisture, the preparation of the seed bed, the method of seeding, and the selection of seed varieties require the greatest consideration in many parts of the Union where the rainfall is relatively small, and it is satisfactory to see that good results have been obtained in practically every instance where correct methods have been applied.

One of the largest growers of maize in the western Transvaal, where the rainfall is considered too small to grow maize under ordinary conditions, stated recently that 30 acres planted with Chester County maize produced 256 bags of 203 pounds each, notwithstanding the fact that the district had been regarded as one where maize could not be profitably grown. He added: "With our increased knowledge through the system of dry-land farming, I feel assured that even better results than this can be obtained in the future." Another farmer in the western Orange Free State reports a somewhat novel manner of producing a crop under dry-land methods as he understood them. With a rainfall of 6.96 inches during the growing season, he harvested 361 bags of maize from 100 acres. This had been planted at the rate of $4\frac{1}{2}$ pounds of seed to the acre. His method was to summer-fallow the land at a depth of 8 inches in January (the middle of summer). After plowing he used a zigzag harrow, and, owing to the presence of weeds, the land was plowed again in June, and left rough. It was again plowed in November (spring) and planted the first week in December. It was neither harrowed nor cultivated during the growing season. There were few farmers within a great distance from his farm who could show that season even so modest a crop.

The Government maintains a division of dry farming, which is in charge of an experiment station at Lichtenburg and of smaller stations at Pretoria, Warm Baths, Pietersburg, and Prieska. Other stations are contemplated for De Aar and Graaf Reinet. Demonstra-

tions of dry farming are also being undertaken at Grootvlei, Orange Free State, and Grootfontein and Vryburg, Cape Province. Municipalities can now apply for a dry-land station to be established in their commonages on the dollar-per-dollar principle, and in a few cases advantage has been taken of this assistance to undertake experimental work of this character. The number of such stations will undoubtedly increase very substantially when the Government's finances after the war permit it to encourage the extension of this idea. The work of the Government in connection with dry farming has undoubtedly exercised a widespread and deep influence upon the agriculture of the Union, by inducing farmers to devote more attention to the timely and proper cultivation of the ground and to put to profitable use large areas of land which, but for the enlightenment and stimulus offered by the agencies mentioned, would probably not have been cultivated at all.

COOPERATION AMONG FARMERS.

In discussing any problem affecting South African farming, and that of cooperation in particular, it is necessary to consider the environment and sparseness of the population, as well as the fact that it is not homogeneous but divided into two races speaking different languages. These conditions have engendered a sense of independence and a lack of desire for mutual help, instead of the cooperation found where farms are small and the struggle for existence more severe. Since the days of early settlement the physical features of the country, the character of its population, its climate, the presence of the natives and of wild animals have made independence and self-reliance necessary for success in farming. These conditions have retarded a recognition of the new phases of farming life brought about by the advent of the smaller farm, the increase of animal diseases, and the competition with the world's markets, calling for cooperation and improved methods of farming. Farmers the world over are conservative, but the Dutch farmer of South Africa, coming chiefly from the earliest settlers' stock, has, through the circumstances surrounding his pioneer life, developed an independence and conservatism from which it is difficult for him to break away, and cooperation, so much to be desired in South Africa, has on this account been very slow in developing.

A division of cooperative societies is maintained under the Department of Agriculture, devoted to the establishment and supervision of such societies. Eighteen of these were in existence during the fiscal year 1914–15, the majority of which were domiciled in the Transvaal. The lack of sufficient funds has caused this division to discourage the expansion of the movement in the Orange Free State, and the absence of legislation has also compelled it to withhold its assistance from this class of societies in the Cape and Natal Provinces, where a great deal of interest has been manifested lately in the cooperative movement. Detailed figures for the business of these societies are not available for the fiscal year 1914–15. The latest figures published, those of the fiscal year 1913–14, show that at that time the total membership was 11,558. There were handled by them 639,452 bags of maize, $437,000 worth of other products, and about $960,000 worth of farming requisites. The position of these

societies has been somewhat precarious up to this time owing chiefly to the lack of competent men to manage them. With possibly one or two exceptions these societies are composed of Dutch farmers, who so far have not generally realized the necessity for a systematic accounting and administration of the affairs of their societies. The Government's division, in cooperation with the Land and Agricultural Bank, is chiefly intended to promote the adoption of adequate administrative methods in the business of the cooperative societies. Little has been accomplished hitherto in this respect, and it is doubtful whether energetic measures will be taken in connection with the cooperative movement until a uniform law applying to the four Provinces of the Union is enacted. It has been the purpose of the Government to place an adequate law on the statute books to promote the expansion of the cooperative movement, and this is likely to be one of the first questions to be taken up after the war, when sufficient funds will be available to render financial assistance to any cooperative societies that may be established under the intended legislation.

The majority of the societies in existence are federated and under the control of a central agency for cooperative societies, which has proved a very effective organization. The majority of the officers of this agency were once connected with the division of cooperative societies, and its existence has enabled the smaller bodies to effect economies in their transactions, as a result of the larger quantities of goods that have been sold and bought collectively.

On January 31, 1914, a statement published by the Land and Agricultural Bank shows that the total amount due to that institution by cooperative societies in respect to advances was nearly $1,500,000. It must be remarked that several of these societies are being financially assisted by banks other than the Land and Agricultural Bank.

The agricultural machinery handled by these societies has been bought by them from the various importing firms in South Africa—the societies in certain cities acting as local agents for them. It would be undesirable at the present time to enter into business relations with these societies in respect to the sale of agricultural machinery, owing, chiefly, to their unsatisfactory financial position. The business is a very small one thus far, the value of the farming requisites given as sold by them being the retail prices received.

There are a large number of cooperative societies throughout the Union that are independent and altogether without Government control or assistance. These are in evidence principally in the southwestern part of Cape Province, in connection with the wine, fruit, and tobacco industries, and in Natal in connection with maize, dairying, tobacco, and wattle bark. The most prominent of these societies is undoubtedly the Natal Agricultural Cooperative Union (Ltd.), of Pietermaritzburg, with a membership of more than 2,000. Its turnover for the year 1915 was $891,620. A special department for the sale of agricultural implements and fertilizers was established a short time ago, which is said to be very successful. It is understood that this concern is prepared to purchase directly from manufacturers. Considering the support it receives from its members, it should be able to give satisfactory representation so far as Natal Province is concerned. There may be the drawback, however, in doing business with this Union at the present time, that the Durban im-

porting firms may refuse to handle in the Orange Free State and Transvaal Provinces (where the Durban importers operate extensively and almost exclusively) the goods of manufacturers selling to the Union.

There is no doubt that the cooperative movement in the Union of South Africa is destined to become an economic force of great importance as soon as the Government is able to devise ways and means to encourage it and to extend to it advice and financial support. It is a source of gratification that the Dutch farmers, generally so conservative, should have taken hold of this idea. Cooperation should be fostered because conditions are such that it will prove difficult to induce individual business men to undertake the establishment of the industries vital to the progress of farming, such as butter and cheese factories, tobacco warehouses, fruit packing, oil-crushing plants, etc., on account of the absence of close settlement and the sparseness of the farms.

FINANCIAL AID EXTENDED BY GOVERNMENT TO FARMERS.

To assist deserving men, and with a view to encouraging agriculture, the South African Land and Agricultural Bank was established in 1912 by the Government, to consolidate the various institutions of that character existing in the country before the Union was formed. The nominal capital of this institution is limited to $30.000,000, and the administration is controlled by a central board in Pretoria and advisory boards in other parts of the Union. The functions of this bank are to make advances for the purchase of stock, fencing material, boring, dipping tanks, planting of trees, vineyards, sugar cane, and in connection with other undertakings that will promote agriculture, such as dairying, preparation of tobacco for sale and export, etc. The advances are made for periods not exceeding 30 years, and are repayable in installments beginning the sixth year after the loan was made; 5 per cent interest per annum is charged for the first 5 years and 7 per cent after that time. The bank has also power to advance money to and guarantee the performance of contracts undertaken by cooperative societies. Such advances are made upon the joint and several liability of every member of the society. The operation of the Land and Agricultural Bank has proved very beneficial, as it has enabled necessary improvements to be carried out that the farmers would have found it impossible to undertake on their own capital. Many new farmers have been, with its assistance, settled on the land, and the advances made on fences, dipping tanks, boring, etc., have done much to put farming on a sounder basis.

Unfortunately, the operations of the bank have been much restricted during the past three years, owing to the financial demands on the Government in connection with the war. At the end of December, 1915, the sum of $1,719,650 was owing to the bank by cooperative societies, and during that year $552,500 was advanced to them. The applications for loans received during 1915 were 401; in 1914, 1,268; and in 1913, 3,889. It will thus be easy to realize the large volume of business and loans that it handles when its operations are unrestricted. Farmers may borrow sums of not less than $250 nor more than $10.000, with the security of a freehold or quit

rent land. In connection with the cooperative movement the bank to a great extent directs and aids the cooperative societies to make the most of the advantages that concerted effort will bring to their members, the relationship being, so to speak, that of a subsidiary concern to a parent body.

There appears to be no reason why the farmers of the Union of South Africa should not be perfectly satisfied with the paternal view that the Government takes in anything connected with agriculture. There is no land tax, the rates of freight for farming produce and farming requisites are extremely moderate, the excise tax on local wines and brandies is exceedingly low, and the customs duties on articles largely imported for farmers are relatively insignificant. Imported food and drink, on the other hand, are subject to heavy duties, designed to encourage and assist farmers in profitably disposing of their produce. It might be difficult to find another country with a Government so eager to assist and encourage the farming community.

LAND AND LEGISLATION.

As long ago as the year 1815 land-settlement schemes were formed to afford relief to the many unemployed, and in 1820 British settlers to the number of 3,053 landed at Port Elizabeth. After the Crimean War homes were found for men on small holdings near King Williams Town.

The secretary of lands has officially referred to the broad acres in possession of the Crown that remain unoccupied and unutilized, pointing out that, although there is a considerable area of Crown land unallotted, it is for the most part not suitable for settlement at present. It was with this knowledge of the limited capabilities of the unallotted Crown land that the Government of the Union passed acts to further land settlement under special and generous conditions. It is known that there is much land held by companies and private individuals that is undeveloped and is suitable for disposal in those small holdings for which there must be so much continual demand.

The land settlement act of 1912 authorizes the acquisition by purchase of private lands suitable for settlement purposes. One of its most useful provisions, and one that meets a real need, is that which enables the Government to purchase any particular piece of land on behalf of an applicant, provided that he is willing to contribute one-fifth of the purchase price and give security for the payment of such amount. Every proposal to acquire land on these terms must be referred to the land board for report.

If the purchase of land for an individual settler is approved, the Government pays the balance of the purchase price of the land, and when transfer has been effected in its favor the holding is allotted to the applicant on a conditional purchase lease for a period of 20 years, during which period the balance of the purchase price, plus any incidental expenditure incurred by the minister in connection with the purchase, transfer, and allotment of the land, together with interest thereon at the rate of 4 per cent per annum, is repayable in half-yearly installments.

As regards the allotment of land acquired by purchase or otherwise and of ordinary Crown land, the procedure is to divide any such

lands as may be suitable for settlement purposes into holdings that vary in extent and valuation according to the district, proximity to a railway line, climatic and soil conditions, etc. The valuation placed on land acquired from a private owner for the purpose of allotment must be at least equal to the cost price, including cost of transfer, subdivision, valuation, etc., and in the case of ordinary Crown lands the present market value of the land. When the land is available for allotment applications are invited therefor.

Holdings that are gazetted as available for disposal are allotted on lease for a term of five years, the rental being calculated as follows: First year—no rent is charged. Second and third years—rent at the rate of 2 per cent per annum on the purchase price. Third and fourth years—at the rate of 3½ per cent per annum on the valuation. Rents are payable half-yearly in advance. The allottee has the option of acquiring the land at any time during the lease or at its expiration at the price of the conditional purchase extended over a period of 20 years.

Advances may also be made for the purpose of providing a lessee with stock, implements, seed, and other things necessary to develop and work the holding. These advances bear interest at the rate of 4½ per cent per annum and are repayable in seven half-yearly installments, commencing 18 months after the advance is made. They are limited to a sum not exceeding $2,500.

The areas of land undisposed of are mostly in the northwestern part of Cape Province and in Bechuanaland. They are much better suited for sheep and cattle than for agriculture. In the Transvaal and Orange Free State Provinces the Crown land available is also situated at a considerable distance from the railway and markets, and it is chiefly suitable for stock farming. In the latter Province there is practically no unalienated Crown land. The greater part of the lands of Natal suitable for agriculture have also been alienated. A good many blocks of Crown land along the Zululand coast were offered for allotment a few years ago, to be devoted to sugar-cane growing. The lessees were to enter into an agreement with the sugar-mill proprietors to supply them with all the cane grown and to keep a certain area of their land under that crop. The proprietors have an agreement with the Government as to the prices to be paid for the sugar cane thus supplied. These arrangements are deemed to have worked very satisfactorily thus far. The Province of Natal has much land that is held by large private land companies. The Natal Land Colonization Co., which has its head office in London, claims to have farms and other properties in every district of Natal Province except in the Albert district.

III. SOUTH AFRICAN CROPS AND PRODUCE.

MAIZE.

The cultivation of maize is a big industry in South Africa, and it will be of even greater importance when it forms the basis for the meat export trade that is certain to become well established during the next few years. South Africa at present is fortunate not only in being able to produce good maize and in having an over-sea market but also in the increasingly large and profitable local markets. Maize is the staple food of the South African native, both in his kraal and when working in the mines. A rapidly increasing amount of maize is also used for feeding stock such as cattle, ostriches, horses, mules, and sheep, to supplement in the winter the scant nourishment that these animals can obtain from the pastures. The Johannesburg mines alone are said to use nearly 1,000,000 bags of maize per year, and the Kimberley mines about 40,000 bags. The maize-producing areas have also to supply the districts of the Cape Province where the crop is not grown. Maize growing has the further advantage of providing the smaller farmers with a crop that they can turn into cash more quickly than any other of their produce.

The extensive use and cultivation of maize in the African Continent have led many to suppose that the plant is indigenous, or at least that it has been grown there from time immemorial by the aboriginal races. While it does not appear that such is the case, still maize has undoubtedly been grown in South Africa for many years. It was probably introduced before the establishment of the Dutch colony in the Cape of Good Hope in 1650—probably by the Portuguese, whose vessels called at Cape Town for water on the voyage to and from their East African and East Indian settlements. It is suggested that the local name "mielies" is a corruption of the Portuguese word for maize, "milho."

The establishment of an export trade in maize has had the effect of steadying the local markets. Before its development, farmers were often able to realize $5 per bag of 200 pounds, but when there was a bumper crop prices fell as low as $0.75 per bag. Since the beginning of an export trade, to absorb the surplus production, the local market has never dropped below a paying price.

The natives provide a valued local market for those farmers situated near native locations. The South African native is ordinarily lacking in thrift. No sooner is his crop harvested than he will start to barter off for trinkets, salt, etc., without any thought of the future. The crop that the individual native grows is small, and in this way it is soon exhausted. Then he must begin to buy back from the local dealer or farmer at greatly enhanced prices. It is this improvidence that largely maintains the supply of native labor. If the native him-

self were a good farmer and thrifty he would not be under the necessity of working for wages, and the white farmer would lose the benefit of his services.

Few countries in the world are better suited for maize growing on a large scale than South Africa. Climatic conditions are very propitious. The country has an ample rainfall at the right season of the year and phenomenally favorable winter weather, permitting the farmers to harvest the crop in such a manner as to produce the quality of grain more desirable for export. The average rainfall during December, January, and February (corresponding to our maize-growing season) in 39 stations throughout the maize belt of South Africa is 11.29 inches, while the average for January is 4.6 inches. The rainfall is, therefore, adequate for the successful growing of maize.

The areas of fertile land suitable for maize growing are enormous, consisting of virgin soil comparable to that of the American prairies and, for the most part, still untouched by the plow. The maize zone may be roughly defined as the country lying east of the 26° meridian—in other words, east of Port Elizabeth in the south and Zeerust in the north. excluding the coastal belt below 1,000 feet altitude and the mountain regions above 6,000 feet. Maize is the staple crop in all native territory. It is cultivated in practically every occupied farm of the Orange Free State and Transvaal Provinces. Many farmers grow 200 to 1,000 acres each, and at least three farmers have 6,000 acres under maize. The farms in these two Provinces probably average 5,000 acres each, but the area planted with maize is usually not more than 5 to 10 per cent of the land and is sometimes much less. The dry Karroo and Kalahari regions are not suited to maize growing, owing to inadequate rainfall. The Cape Peninsula and adjacent areas have chiefly winter rains, and this fact precludes the possibility of maize growing there. The western districts of the Orange Free State and Transvaal Provinces are in the same category because there is a deficiency in the spring rainfall and, also, the intervals between the rains are usually too great.

The acreage under maize and Kafir corn and the production of these cereals in 1911, according to the census of that year, were as follows:

Provinces.	Maize.		Kafir corn.	
	Acres.	Bags.[a]	Acres.	Bags.[a]
Cape Province	1,727,864	242,327	299,422	19,333
Natal	1,805,745	231,667	594,132	8,108
Orange Free State	1,788,294	905,502	191,414	85,485
Transvaal	3,310,613	892,113	462,758	52,485
Total	8,632,516	2,271,609	1,547,726	165,411

[a] Bags of 200 pounds each.

There are no statistics showing either the acreage or the production of this crop since 1911, but official estimates have been published from time to time showing that the acreage under maize has largely increased; this increase probably amounts to about 25 per cent since 1911. The production of maize in 1915 is given as 10,000,000

bags, against 8,632,516 in 1911. While the acreage in 1916 was officially estimated to be 9 per cent larger than in 1915, the drought was responsible for a 20 per cent decrease in the 1916 crop. A good deal of maize is also grown by the natives, it being their staple crop, and if a correct return of the acreage they cultivate were available it would probably be found that the amount of land devoted to maize is substantially larger than the above figures indicate. The present production of maize in South Africa is universally admitted to be an infinitesimal proportion of what might, and doubtless will, be produced in the future. There are still many farmers who apparently believe that maize is a Kafir crop and that it does not pay the more ambitious white farmer to grow it.

The consumption of maize in South Africa is estimated at about 7,250,000 bags, but with the advent of a beef export trade that will cause an extension of the practice of artificial stock feeding the amount of maize consumed ought to increase very largely in the next few years. There were exported from South Africa in 1915, 1,493,000 bags, valued at $3,073,905, as compared with maize exports valued at $2,133,907 in 1914. The value of the maize exported during the first six months of 1916 was $3,019,313, as against $757,073 in the corresponding period of 1915. Most of the maize shipped in 1916, however, formed part of the 1915 crop, which was the largest ever harvested in South Africa, though it was not grown under favorable conditions. A lack of moisture was observed throughout the growing season.

During the past season farmers obtained from $2 to $2.50 per bag, and the grain exported was shipped chiefly to England, Australia, and Portuguese East Africa. Before the war large quantities of maize were shipped to Germany. In the over-sea markets South African maize always obtains as good prices as that from the United States and Argentina. Often a slightly higher price is obtained, due chiefly to its being preferred for manufacturing purposes on account of its greater dryness. The moisture contained in maize exported from South Africa is about 4 per cent lower than that of the American, and this minimizes the danger of transportation and puts a premium on South African grain for manufacturing purposes. Previous to the war the freight charged by the Conference Lines for carrying a ton of 2,000 pounds of South African maize to England was $2.50; during the early part of 1916 it was about $15 (the freight from the River Plate to England at that time being about $27). These figures show the encouragement given to the exportation of maize by the shipowners interested in the South African trade.

CAPE PROVINCE.

The Cape Province produces less maize in proportion to its area than any of the other Provinces. The absence of summer rains in the southwestern districts makes that part of the country poorly adapted to maize culture. In the Karroo and northwestern districts the total rainfall is too small to produce good crops of maize. In some of the eastern districts, however, especially the Transkei, the climate is favorable for the production of excellent crops of the cereal. In this region, however, there does not appear to have occurred the same rapid increase in production that is noticeable in other parts of South

Africa. In fact, during the 12 years from 1895 to 1907 the production of the Victoria East district fell off from 20,000 bags to nearly one-third of that number, while in the King Williams Town district it fell off 15 per cent. In other districts the production increased considerably, and in two or three places it doubled and even trebled. In view of the increasing importance of these districts in connection with live-stock raising, the production of maize is certain to become very much larger in the next few years.

NATAL.

Maize is produced in all parts of Natal, but the midland districts, 2,000 to 3,000 feet above sea level, are generally considered to be the best for this crop. The coast belt is better suited to sugar cane and citrus fruits than to maize, owing to the rapid and luxuriant growth of weeds and the consequent cost of cleaning the land. Wherever maize is grown on the coast belt, however, the average yield per acre is about 1¼ bags higher than upcountry, and along the coast of Natal to the Ubombo Range and Swaziland and in the adjacent portion of the Transvaal, the season between frosts is so long that two successive crops of maize have been matured in the same year. Although the uplands of Natal produce a fairly large quantity of maize, on the whole they seem to be better adapted to stock raising than agriculture. Camperdown and Richmond are considered the best part of the maize belt of Natal, the rainfall there being about 30 inches. One of the pioneer maize growers has harvested an average of about 12 bags of maize on 220 acres, while on 10 acres he averaged a crop of 22 bags. It is estimated that the area in which maize is grown in this Province is more than double that of all the other crops combined. Light-gray sandy loams prevail in the maize-growing districts of Natal, and because they are subject to much washing, it has been found that plowing should be done as near planting time as possible.

ORANGE FREE STATE.

The Orange Free State, together with the adjoining native territory of Basutoland, is perhaps the chief among the four Provinces of the Union in the production and exportation of maize. In this connection it is interesting to note that of the total area of this Province less than 2¼ per cent is planted with maize, and that in the best producing districts only 5½ per cent of the land is planted with this crop. With this in mind, it is not difficult to realize the immense opportunity for maize growing in South Africa. The northeastern districts, where the rainfall is about 11 inches during the three maize-growing months, have the largest acreage and produce the best crops of this cereal. A large quantity of maize is also grown by natives, the average yield of their crops being estimated at about 7 bushels per acre.

TRANSVAAL.

Maize is a crop eminently suited to the Transvaal. It is grown in every district and on practically every occupied farm. The principal districts, in the approximate order of production, are Bethal,

Vereeniging, Heidelberg, Potchefstroom, Pretoria, Standerton, Ermelo, Middleburg, and Lichtenburg. Only a very small area of the Transvaal seems unsuited to the cultivation of maize, and at present the acreage under this cereal is estimated to be four times as large as that of all the other crops combined. To appreciate the progress of agriculture in Transvaal Province, it may be of interest to observe that in 1907 it imported nearly 400,000 bags of maize. Since that time it has eliminated the necessity of importation and provided for the wants of its rapidly increasing native population, and in 1912 the Transvaal, with 450,000 bags, contributed more largely to the Union's over-sea exports of maize than any other of the four Provinces.

Most of the Transvaal maize is produced on the highlands, where the population is greater and there is more land under cultivation. A good deal of maize is also grown in the lower lands, but chiefly by natives. The altitude range of the crop is from 600 feet at Konatipoort to over 6,000 feet in the Steenkampsburg and Drakensburg Ranges, but the greater part comes from the plateau between 4,000 and 5,000 feet above sea level. The southwestern districts are less suited to maize, by reason of the low rainfall, the short growing season, and the shallow soil that is often encountered. The average yield of maize in the Transvaal is about four bags per acre.

Early winter frosts are dangerous to the maize crops in the higher plateaus of the Transvaal at 5,000 to 6,000 feet elevation, because the season is usually too short for late-maturing breeds of maize, and nearly every year a part of the crop of medium-late types, such as Hickory King, is seriously injured. When the South African maize crop is once ripe, however, frost will not injure it, and it can be left standing in the field to dry out through the winter without fear of damage. In view of this danger it has become quite common in the Transvaal to cut the grain just before the frosts are expected and to stack the crop in the field. This does not interfere with the proper filling out and ripening of the grain if the crop is not cut before the grain has begun to harden. This method enables farmers to save their crop from injury by frost, and, besides, it results in a saving of some 50 per cent on the feeding value of the stover.

PLOWING FOR MAIZE.

New lands and lands that have been fallowed with a rotation crop are plowed as early as possible in the autumn (preferably in January, February, and March), in order to make a good seed bed and to conserve the moisture for early planting. Old lands are plowed as fast as they are eaten down by the cattle. The practice of waiting for the early spring rains before plowing the land is fast disappearing, because if these are late there is the risk of not being able to plant early enough so that the crop will be fully matured before the early frosts. The method of plowing as soon as possible after the crops have been cleared from the land is gaining in popularity, because a certain amount of moisture is thus kept on the land for the following crop and the operation is much less difficult than if the plowing is done later in the winter when evaporation has considerably hardened the soil.

Eight to 9 inches is perhaps the average depth of plowing in the highlands, but deep plowing is always preferred so as to make a deep seed bed that will store the greatest possible amount of moisture. The interest taken lately in the mechanical means of plowing is chiefly due to the conviction that deeper plowing is necessary in order to insure the crops against the effects of drought. In Natal, where too much rain may fall during the maize-growing season, deep plowing is said to enable the moisture to drain away much better.

If proper efforts were made to acquaint South African farmers with the advantages of subsoiling, many of them would probably adopt that practice. The best method would be for the subsoiler to be attached behind the plow bottom. The double-furrow moldboard plow is the type most extensively used for plowing lands for maize. Quite often a disk plow is used for cross plowing, and this is also used by a great number of farmers to the exclusion of any other type of plow. Disk harrows and spike harrows are being used to an increasing extent to keep the soil in good condition from the time the land has been plowed to the time of planting.

PLANTING.

The planting season lasts for two months, as compared with the maximum of three weeks in the chief maize-growing districts of the United States. South African farmers, therefore, enjoy the advantage of a long and favorable planting season. Planting can be started as early as September, and in certain sections this can be continued until Christmas. Most of the maize, however, is planted during the month of November, but the general practice is for farmers to wait for the occurrence of the first spring rains, expected during October and November. Maize for ensilage is generally planted in January.

Two-row planters, four-fifths of them fitted with fertilizer attachments, are used by perhaps more than 50 per cent of the farmers in planting maize. The distance between the rows varies in different localities and different soils, the same as in America; but 3 feet between the rows (and 12 to 24 inches in the rows) is perhaps the distance most in vogue. Because South Africa is subject to periodic droughts, deeper planting is required than in countries having a more uniform rainfall. It has been suggested that one of the causes of the low yields of maize may be found in the thickness of planting. Twenty pounds of seed per acre are generally used when planting Hickory King. A good many farmers still sow their maize broadcast, and the usual Kafir method of planting is to scatter the seed broadcast over the unbroken ground and to plow the land afterwards.

The necessity for commercial fertilizers for the maize crop varies, of course, between different localities. The soils of the chief maize-growing Provinces are usually poor in humus, and a combination of superphosphates and nitrate of soda has been found to increase the yield considerably. It seems to be quite a common practice to use 150 pounds of fertilizer per acre, drilled in the soil with the seed. The average crop reaped has been doubled when this has been done, as compared with that produced on unmanured land. There seems to be a growing tendency to use kraal manure in fertilizing the land for

maize, and consequently large hoppers should be provided with the planters. The construction of maize planters, including the fertilizer attachment, should be as simple as possible on account of the inefficient labor employed. An official of the Department of Agriculture stated recently that most South African fields of maize do not average more than 50 per cent of a stand. Check-row planters have not been used to any great extent thus far and are not likely to become popular for some time to come.

VARIETIES GROWN.

Since thousands of bags of maize are lost every year on account of early frost, early maturing varieties, as well as varieties that take less time to mature, are the most popular. Drought-resisting varieties are also required for the districts of what may be called the border of the regular maize belt. In South Africa Hickory King is the best known and most extensively grown breed of white dent maize, probably on account of its ability to thrive on relatively poor soils and with rough treatment. As a drought resisting and early maturing breed, Iowa Silver Mine is largely grown. Other white dents are Louisiana, Hickory Horse Tooth, and Boone County. The most popular yellow dents are Yellow Horse Tooth, German Yellow, Golden Beauty, Chester County, Eureka, Yellow Hogan, Golden Eagle, Red Yellow Dent, Minnesota Early, Leaming, and Golden King. The principal flint breeds grown are Botman, Gango, Repatriation, North Dakota, and Wills Gehu.

CULTIVATING.

While many farmers practice altogether modern methods of maize cultivation, and some of the most progressive cultivate their crop as often as eight times in a season, on the other hand there are many farmers who do not appear to understand the benefits of cultivation; on account of the uncertain rainfall and great evaporation of moisture this is very essential in maize growing in a country like South Africa. Some farmers claim that it costs too much to keep the land well cultivated, and that it is difficult to secure sufficient labor to keep the lands clean. They, however, think nothing of putting large areas under maize, often losing sight of the fact that it would be less expensive and troublesome to reduce the acreage and to keep in good tilth and cultivation whatever land they put under crops.

All types of cultivating implements are used in South Africa for cleaning the land of weeds and keeping a loose dust mulch on the surface. The scarifier is still the chief implement used, but arch walking cultivators and disk cultivators are being used in increasing numbers. It is a common practice to harrow the land with the spike-tooth harrow as soon as the plants appear above the ground, and this implement is also used when the plants are 6 to 8 inches high. Anticlog weeders are also extensively used during the early period of growth; when the plants are larger, inter-row cultivation is commenced. Experiments conducted at the botanical experiment station, Pretoria, show that it requires from $3\frac{1}{2}$ to 11 days after sowing for the maize seedling to appear above the ground. In a few parts of South Africa the soil is light and sandy; in such districts

much cultivation of the maize is inadvisable, and the less the land is disturbed the better. Along the Vaal River the soils blow away if too much cultivation is practiced.

HARVESTING OF MAIZE.

The harvesting season begins about the middle of June in the highlands, and in the midlands and Natal somewhat earlier, as climatic conditions make it possible to start planting earlier if desired.

Owing to the dryness of the winter over the greater part of South Africa, the farmer is able to continue harvesting and shelling maize in the field up to the very day when he begins to prepare his lands for the new crop. The maize crop is generally allowed to dry off as it stands in the field, and the usual method of harvesting is for natives to pick the ears by hand, husking them at the same time. They open the husks with one hand while they catch hold of the ear with the other, and with a sharp twist the ear is dexterously removed. This is dropped into a bag that they carry around the neck. When the bag is full it is emptied into a sack common to three or four natives, and this, when full, is carried to the headland, where a heap is made. The sheller is moved from one heap to another. The percentage of matured maize damaged by the weather in South Africa is exceedingly small, and the moisture contained in the grain exported is about 5 per cent less than that of the American-grown maize.

The prevalence of weeds is a troublesome problem in South Africa after a piece of land has grown maize for three or four years in succession; this is perhaps responsible for the common practice of abandoning maize lands after the third or fourth year (the farmers believing, besides, that they are worn out). The advisability of this practice is very questionable, inasmuch as new lands usually give poor maize crops, whereas, by means of tillage, the land becomes opened up to the air and water and chemical changes take place that liberate the plant food and make it available to the plant. A better understanding of proper cultivation and of manuring old lands, instead of abandoning them, will probably serve to increase the yields of maize. Experiments on Government farms have shown that the best crops of maize are obtained the fourth, fifth, and sixth years of continuous cultivation of the soil. The annual weeds grow on the high lands of South Africa almost exclusively during the wet summer months. When the rains fall at sufficiently long intervals to allow the soil to dry out thoroughly, the weeds can be kept down with the horse cultivator; it often happens, however, that the rain falls so continuously during the height of the growing season that the lands remain too soft for cultivation over a long period, and the weeds are likely to get ahead of the maize crop unless other methods of treatment are adopted. The principal annual weed pests of the maize crop in South Africa are blue jacks, sweet grasses, goose grass, wild gooseberry, and Mexican marigold. Pig weed and Bermuda quick grass are also very prevalent. Less troublesome, but found in certain sections, are the Rooinek burweed and Kafir melons. The Is-Ona, or witch weed, is one of the most troublesome pests with which the South African maize grower has to contend.

It is not likely that, for some time to come, many corn binders will be sold in South Africa. A few are in use, principally for cutting maize for ensilage purposes, but in a number of cases it is said that farmers who bought corn binders soon discontinued using them, preferring to have the work done by hand. So far as costs are concerned, it appears that the hand method is the better in conditions such as exist in South Africa. Since oxen are generally used, three natives are ordinarily employed, one to lead the oxen, another to drive them, and a third on the machine itself. In the United States, where good horses are generally used, the average acreage cut per day with a corn binder is stated to be 7 to 8 acres. With oxen, therefore, and with black labor, an average of 6 acres per day is all that a corn binder could be expected to cut. Against this we find that a native in South Africa will cut at least 2 acres of maize per day, and it is consequently apparent that farmers are not likely to consider the corn binder a profitable investment. It is of little interest to them that such a machine would bind in bundles the stalks cut, since the general practice in South Africa is simply to remove the ears from the stalks and to let the cattle onto the fields to eat the stalks down after the ears have been removed from them. It is only when cutting maize for ensilage purposes that a farmer is likely to become interested in corn binders.

The average yield of maize in South Africa is estimated at 12 to 14 bushels per acre. This is a low yield, but the methods adopted by the more progressive farmers who obtain higher yields are likely to exercise a favorable influence. The present low average yields are considered to cover the expenses of production; so good farmers in South Africa ought to find maize growing highly remunerative in normal seasons. The cost of production is estimated at between $0.85 and $1.50 per bag, although some farmers have declared that they can produce maize at a cost of $0.25 per bag. In the district of Zoutpansberg, the Department of Agriculture has produced 127 bushels of shelled Austin Colossal, yellow dent, per acre, and at the Government Experimental Farm at Potchefstroom 125 bushels per acre of a white dent were produced. Although the average yield per acre in South Africa is low, the weight of the grain is comparatively high.

Hand husking is generally practiced when small acreages of maize are grown. Power huskers and shellers of British make, however, are being increasingly used. These cost from $1,000 to $1,250 to the farmer, and are usually driven by portable engines at 6 to 7 nominal horsepower. Their capacity is 120 bags per hour when shelling only, and one-half that quantity when husking and shelling. Because of the capital outlay involved in the purchase of a shelling outfit of this description, comparatively few private farmers own one, but the number of itinerant machines is increasing. The Marseilles-Adams husker and sheller, a smaller machine costing from $375 to $675 in South Africa, according to capacity, is well known in the Union. Practically all farmers have machines of some sort for shelling husked maize. These are worked either by hand or power, and vary in capacity to suit the needs of the individual. The prices at which they sell range from $7.50 to $250.

To reduce bulk it is becoming customary to shell the maize early and sack the shelled grain in bags that invariably weigh 200 pounds

net and 203 pounds gross. The method of storing the grain varies considerably. Since the winters in the maize belt of South Africa are generally dry the bags of maize can be stacked upon a raised platform in the open and protected with a canvas cloth, while in other cases they are stored in sheds. The Government has been requested to erect suitable warehouses at the chief inland grain-exporting railway stations for the storing of maize by farmers and merchants, a charge to be made for holding and storing the grain. While no coordinate action has yet been taken in this regard, the railway administration leases the land for the erection of grain storehouses contiguous to the railway stations, and several cooperative societies have already erected warehouses for storing the grain shipped by their members. There has been much discussion lately concerning the erection of grain elevators at the chief maize-growing centers and at seaports where the bulk of the maize export trade is handled. It is not unlikely that before long a beginning will be made along these lines. That a big saving will be effected is indicated by the fact that the bags for maize commonly used in South Africa retail at $0.18 each. If the production of maize in South Africa is taken at 10,000,000 bags per year, the total expense resulting from the use of these bags is $1,800,000. While the erection of elevators would require considerable sums of money and make it necessary for the railways to provide themselves with suitable equipment, it is felt that the saving effected in time and labor would pay in a few years for the equipment required.

In South Africa maize meal is the natives' chief article of diet, and, to a less extent, maize in different forms is also consumed by the white inhabitants of the country. The bulk of the maize meal is made in large milling plants, although small hand and power maize mills are used by an increasing number of farmers. The native method is to grind the maize between two stones, the one hollow and stationary on the ground, the other round and held by the hand. An increasing proportion of the maize crop of South Africa is used as winter feed and for fattening cattle for slaughtering. All the various types of crushers and grinders used in the United States, as will be seen later, are coming into vogue in South Africa. The surplus of the maize crop not required by either natives or cattle is exported overseas.

KAFIR CORN.

Kafir corn is chiefly grown by natives and by white farmers situated near native settlements. Of late years the acreage under Kafir corn appears to have slowly decreased. This crop holds its own, however, in localities where the rainfall is generally too precarious to grow maize, as it is said to be far more capable of resisting drought than maize. Kafir corn is handled on more or less the same lines as maize. The amount of seed sown per acre varies from 8 to 10 pounds when it is sown with planters by the white farmers, and from 12 to 15 pounds when sown broadcast by the natives.

SILOS AND ENSILAGE.

Because of the dry winters experienced in South Africa, it is not considered necessary to build silos of the substantial type that one finds in the maize-growing districts of the United States. The great

majority of silos used in South Africa are very primitive and crude. Pit silos are most common; they are constructed by digging a big hole in the ground, wherein the ensilage is stored and covered with straw or hay, as well as some sheets of corrugated iron to prevent rain from soaking into it. In some cases trenches are made 3 or 4 feet square in the section along the headlands, wherein the ensilage is placed. Ditches are constructed alongside, in order to lead any rain away from the trench containing the ensilage. The more progressive farmers, however, are building modern silos to an increasing extent, and some very fine structures, erected in accordance with the most scientific principles, are already to be seen in the country. The great majority of farmers who have silos use ensilage cutters, and it is pleasing to note that the various types of ensilage cutters made by an Ohio company are most popular in South Africa.

WHEAT.

Wheat growing is an exceedingly remunerative industry in South Africa, and the farmers who are so situated that they can grow wheat are considered extremely fortunate. Very good prices are obtained for locally grown wheat, because of the heavy importations that are still necessary to supply the requirements of the country. Wherever wheat can be grown, this is naturally done in preference to raising maize or any of the other staple crops of South Africa.

The Union consumption of wheat is estimated at 3,700,000 bags, of 200 pounds each, per annum. In 1911 South Africa produced 1,810,315 bags of wheat, and in 1914 2,158,804 bags, this being much less than the quantity consumed. Owing to these circumstances, the South African grower receives for his wheat as much as the grower of the imported wheat, in addition to the cost of importing, with its numerous items of expense, such as freight, insurance, commissions, etc. He is further benefited by inducements designed to encourage the production of wheat in South Africa, such as the duty of $0.28 per 100 pounds imposed on imported wheat and the much lower freight rates charged by the Union's railways on South African wheat. Since the beginning of the war, with the good prices paid for wheat and the high ocean freights, the South African wheat farmer has reaped, so to speak, a golden harvest, receiving an average of $6 to $7 per bag of 200 pounds. The wheat harvest of 1915–16 was a very good one, and this fact is reflected in the decreased quantity of wheat and flour imported (about 20 per cent less than in the previous year). In normal times the South African farmer receives $4 to $4.50 per bag of 200 pounds. In other words, he receives from 50 to 75 per cent more than the growers in the chief wheat-producing countries of the world.

It is said that the area in which wheat can be grown in South Africa is very small, owing to the distribution of the rainfall, and for this reason more than two-thirds of the wheat produced in South Africa is grown in the Cape Province, chiefly in its southwestern districts. In the other parts of South Africa the rains fall in the summer, which may cause a deficiency of moisture during the early spring, when wheat attains most of its growth. Through irrigation, however, and a better knowledge of the science of soil cultivation

making for the conservation of moisture, the areas under wheat are gradually expanding, and this cereal is now grown in commercial quantities throughout the Union, with the exception of Natal. Greater experience in irrigation and intensive cultivation should enable South Africa in a few years to stop the flow of its money overseas to pay for foreign wheat supplies. The Government is working energetically toward this end, and it called a Wheat Congress to be held at Bloemfontein in September, 1916, with a view to discussing and encouraging the cultivation of the cereal. In 1915 $7,029,659 worth of wheat and flour were imported, of which the United States' share amounted to $3,049,305.

CAPE PROVINCE.

The chief wheat-producing districts of South Africa lie in the extreme southwestern corner of Cape Province. These are Malmesbury, producing 271,157 bags; Caledon, 101,249 bags; Piquetberg, 94,730 bags; Paarl, 38,515 bags; and Bredasdorp, 36,866 bags. Malmesbury is the most noted and important wheat-growing district of South Africa, and it produces from one-fifth to one-fourth of all the wheat grown in Cape Province. One of the leading business men of that city stated that good crops have been harvested during the past 60 years, with only one or two exceptions (in which seasons, however, the crop was far from being a failure). In small quantities wheat is also grown in the districts adjoining those mentioned.

The second largest group in point of production is situated in the extreme east, adjoining the Transkei territories, comprising chiefly the districts of Queenstown, Tarkastad, Cradock, Albert, Aliwal North, Herschel, Barkly East, Cathcart, Glen Grey, and Wodehouse; these districts produced a total of 157,745 bags in 1911. It is necessary to remark in connection with the production of wheat in these districts that the industry is not so well established there as in the southwestern districts. Wheat is sown every year, it is true, in large areas, but according to one of the leading farm-machinery merchants in Queenstown, good crops have been obtained only five or six times during the past 20 years, considering the area planted. In view of these circumstances, wheat growing is very much a matter of chance, and therefore, until recently, very careless cultivation methods prevailed. Lately, owing to the profitable prices obtained, better methods have been adopted and are certain to be permanent. The land heretofore has been plowed carelessly, and the seed has been sown in a like manner. With favorable rainfall and climatic conditions, generous crops have been harvested; otherwise the cattle have been turned into the fields and the land has been prepared for maize.

In the Transkeian territories conditions similar to those just described prevail in a greater or less degree, although rainfall and other climatic conditions appear somewhat more favorable to wheat growing. In 1911 the Transkei produced nearly 10 per cent of the total wheat output of Cape Province. There are also isolated districts in Cape Province where wheat is grown. Among these the most important are Calvinia, Humansdorp, Namaqualand, Swellendam, Oudtshoorn, and Uniondale.

In the northwest of Cape Province, along Carnarvon and the Zak River, much development work has been done in recent years in order to grow wheat by utilizing the flood waters of the Zak, Fish, and Doorn Rivers, which deposit a very rich silt on the lands in addition to thoroughly irrigating them. These rivers have shallow beds and easily overflow, this occurring from one to three times in the course of a year, although droughts often upset all calculations. In good seasons very large crops are obtained in these districts.

NATAL.

The acreage under wheat in Natal is very small, indeed, and there are no indications at present that this industry will attain much importance in the near future.

ORANGE FREE STATE.

A number of districts in the northeastern part of the Orange Free State, especially along the borders of Natal and Basutoland, are increasingly taken up for wheat growing as a regular undertaking, and they are second in importance only to the southwestern districts of the Cape. The districts of Bethlehem, Ficksburg, Ladybrand, Senekal, and Harrismith are the most noted for wheat growing in this Province. On a small scale wheat is grown in all the other districts east of Bloemfontein.

TRANSVAAL.

That there are a good many districts in this Province where wheat can be successfully grown has been demonstrated in recent years. Whereas in 1911 only 73,072 bags were grown, the crop for 1915–16 was estimated at 300,000 bags. The eastern districts of the Transvaal are very rich agriculturally, and wheat is extensively grown there. In the districts of Potchefstroom and Lichtenburg the growing of wheat has made very rapid strides. As the principles of dry farming are better understood, this should become a very important crop in the Transvaal. The chief difficulty is that 80 per cent of the rainfall occurs in the summer, which is bound to interfere with the harvesting of the crop. By selecting early maturing varieties and fostering the growth as much as possible toward the end of the winter and in the early spring this difficulty may be overcome to some extent. The uplands are considered the best in the Transvaal for wheat growing, and there a large proportion of the crop is now grown under irrigation.

PLOWING.

Plowing for wheat in the Cape Province is done in January and February. Owing, perhaps, to the satisfactory rainfall in the chief wheat-growing districts of that Province, plowing is done only 5 or 6 inches deep. In other parts of South Africa where wheat growing is adequately undertaken the plowing is as deep as possible, so that when the rains come the land will be ready to absorb and store the maximum of moisture.

PLANTING.

All seed wheat, barley, oats, and rye is dressed with a smut preventive before the sowing. Bluestone is ordinarily used for this purpose. The grain is sprinkled with a solution of copper sulphate (bluestone), 1 pound to 10 gallons of water. Some farmers dip the bag of grain in a tank containing the solution. Others heap the grain on the floor and spray or sprinkle it while it is being shoveled over.

Planting in Cape Province is done in May and June, and, so far, grain drills have not been used to any marked extent. To prevent rust, the seed is mixed with bluestone, which tends to moisten it. Some of the farmers who have tried grain drills state that on this account the seed does not flow easily through the spouts, causing it to choke the machine. They also claim to have experienced difficulty with grain drills on account of the hilly nature of most wheat lands, which causes the seed to crowd toward the side of the hopper traveling lower, with the result that no seed is available for the drills on the higher side of the seed box. The seed is sown rather thinly, and it is often allowed to grow a second time without disturbing the ground; that is, after the regular wheat crop has been harvested, the land remains idle and a second crop is harvested the following season from the seed fallen into the soil during the harvest. Rust-resisting and early-maturing varieties are those chiefly cultivated. The Rietti wheat seems to be generally preferred, and there is also a preference for Du Toit and Een Been wheat; Medeah and Red Egyptian wheat are also grown to some extent. In the Transvaal, where it may be said that the farmers are of a more progressive type (perhaps because of the greater effort it takes on their part to make a success of wheat growing), grain drills are used in planting wheat more often than in the Cape Province.

HARVESTING.

Harvesting takes place during November, December, and January, and in the southwestern districts American binders are used almost to the exclusion of all other types and makes of machines. There is a marked contrast between the conservative, backward methods in planting and plowing for wheat and the fact that the farmers there are content with nothing but the best types of harvesting machinery. Malmesbury is by far the most important center in South Africa for the sale of grain binders, the local firms importing their requirements direct from the United States, even though Cape Town is not far distant. In the other parts of South Africa where wheat is grown, binders are not used to the same extent as in the southwestern part of Cape Province. Reapers, mowers with repair attachments, and even plain mowers are chiefly used to harvest the small cereals; hand harvesting, it may be noted, is still done extensively.

The average production of wheat in Cape Province may be taken as tenfold, or from 6 to 8 bushels per acre. In the Karroo districts, as well as in other sections where irrigation is resorted to, the yields are greater, one hundredfold being not uncommon.

Barley, oats, and rye are handled on more or less the same lines as wheat. Oats are largely cut for hay and used as forage for cattle and horses, and in this connection there is quite a large trade in presses for baling oat hay. The ordinary hay press is not suitable for this purpose, since the common practice is to lay the oat hay flat so that the heads project in one of the sides of the bale. In other words, the oat bundles are carefully laid flat by hand and the bale is pressed with care so as to avoid thrashing the grain out.

The following tables give the acreage and the production of wheat and other cereals in the Union of South Africa according to the census of 1911:

ACREAGE.

Provinces.	Wheat.	Oats.	Barley.	Rye.	Total.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Cape Province	485,018	500,038	90,304	90,503	1,165,863
Natal	2,327	16,629	2,583	866	22,406
Orange Free State	236,682	184,502	8,910	15,445	445,539
Transvaal	73,072	102,192	5,949	666	180,879
Total	797,099	803,361	107,746	107,480	1,814,687

PRODUCTION.

Provinces.	Wheat.	Oats.	Oat hay.	Barley.	Barley, cut green.	Rye.
	Bags of 200 pounds.	*Bags of 150 pounds.*	*Tons of 2,000 pounds.*	*Bags of 160 pounds.*	*Tons.*	*Bags of 200 pounds.*
Cape Province	1,305,006	1,228,927	147,325	373,509	25,248	169,287
Natal	7,231	43,639	4,892	2,807	2,086	828
Orange Free State	265,487	155,067	54,081	12,381	11,180	1,270
Transvaal	232,591	633,289	46,803	18,939	5,625	31,318
Total	1,810,315	2,060,922	253,101	407,636	44,139	202,703

About $260,000 worth of South African grain and meal, aside from maize and Kafir corn and meals therefrom, were exported during 1915, more than one-half of which was oats.

SUGAR.

The culture of sugar is extensively carried on in the warmer parts of Natal and Zululand, along the coast, and it would be difficult at the present time to find any other industry in South Africa enjoying the same degree of prosperity. It is now considered the most important in Natal, and it ranks among the first agricultural industries of the Union. Considering the expense involved in the planting of sugar cane, the progress made in the last few years is very remarkable, the production having nearly doubled since 1911. The census of 1911 gives the acreage under sugar cane as 53,000 acres in Natal and 11,000 acres in Zululand. The actual land under cultivation at present is 140,763 acres. The production has increased from 79,633 tons of sugar in 1911 to 112,000 tons in 1915, with an estimated crop of 120,000 to 130,000 tons in 1916. The importation of sugar by the Union in 1915 was 16,000 tons, or 50,000 tons less than in 1906. In the 12 months from May 1, 1915, to April 30, 1916, fewer

than 4,000 tons were imported. There is a protective duty of $20.50 per ton of 2,000 pounds on all sugar entering the Union from abroad, with the exception of that grown in Portuguese East Africa, which is on exactly the same footing as Natal sugar so far as Transvaal Province is concerned.

In order to ascertain whether sufficient sugar could be produced within the British Empire to meet the present and prospective requirements of the United Kingdom, the West India Committee, in October, 1914, addressed a circular letter of inquiry to the governments of the principal tropical possessions of Great Britain asking what openings there were for the expansion of the sugar industry. The Governor General of the South African Union furnished in reply the following statement:

> The actual acreage at present under cultivation for cane in Natal and Zululand is 140,763 acres; the acreage suitable and at present held for this purpose is 46,662 acres; and the acreage which, being suitable, might be rendered available is 184,644 acres, making a total of 372,069 acres either under cultivation or suitable for the purpose.
>
> The approximate amount of sugar which the Province of Natal (including Zululand) would be capable of producing, having regard to the difficulties of labor supply, and provided that reliable markets could be obtained oversea, is 332,048 tons.
>
> The present output of sugar in Natal is about 100,000 tons, and to produce this amount there are employed on the sugar estates 13,000 Indian men and 8,000 to 9,000 Indian women and children, as well as a number of natives amounting, it is thought, to about 25 per cent of the total labor employed, though reliable figures can not be obtained owing to the fluctuation of the native labor supply.
>
> It is considered that the coast lands of Natal are capable of producing 250,000 tons of sugar per annum, but in order to do this it would be necessary to supplement the labor at present available by at least 30,000 Indians, or 40,000 natives.
>
> The problem of the supply of labor is a most serious one, and no increase in the present output can take place unless there is an increase in such supply.

Sugar farms in Natal and Zululand vary in size from 250 to 500 acres, and there are several sugar estates with 3,000 or 4,000 acres under cane. Land suitable for sugar cane can not be procured for less than $50 per acre, and it is already difficult to get land within a short radius of the sugar mills. When the estates are a long distance from the mills tramway lines are used for the transportation of the cane to either the mills or the nearest railway station.

Although the country teems with blacks, these do not constitute the steady and reliable labor supply for which the sugar industry calls. The Kafir, as has been said elsewhere, is not a worker in the real sense of the word. He is able-bodied, hardy, and enduring, but nothing short of compulsion, physical or economic, will make him devote himself to steady work. This difficulty was overcome when the Natal Government, in 1860, legalized the importation of coolies from India, but, owing to restrictive legislation on the part of the Union, a few years ago, against Indian traders establishing themselves in the country, the Indian Government took steps to prevent the further recruiting of labor within the Indian Empire. The last coolies arrived in South Africa in July, 1911. For work in the sugar fields $7.50 per month is paid to natives and from $7.50 to $15 to coolies. A number of Mauritius planters and trained artisans settled in Natal many years ago, introducing competent labor to run the sugar mills, as well as to assist in the growing of sugar generally.

Yuba cane is the type most extensively cultivated in Natal. From a milling point of view, this cane is undesirable. It is thin, tough, wiry, and fibrous, and the juice requires special treatment. Mill managers say that from 10 to 30 per cent more mill power is required for this cane than for any other variety. It has proved, however, the best variety for the Natal planters because it endures the uncertainty of the climate better than any other that has been tried. It is hardy, bears frost and drought, stools prolifically, recovers readily from locust attacks, and is but little damaged by white ants and the borer. It yields satisfactory rotoons five or six times as compared with three rotoons in the case of other varieties. The first rotoon crop is stated by some planters to yield better than the plant cane crop itself. This variety of cane produces up to 20 canes per stool.

PLOWING.

Hillside reversible plows are used by small farmers in preparing the land for sugar, owing to the undulating and hilly formation of the land where sugar is grown. In the case of the large estates, where the lands occupy entire hills, the ordinary type of plow is used. One of the most prominent men in the industry stated that plowing is seldom done deeper than 10 inches. Where the soil is loose or sandy, as is often the case, the land is not plowed for cane planting. The making of holes is considered sufficient. The river flats, in the early days, were considered the best land for this crop, but it was discovered that the cane was liable to injury from frost, so the cane fields have been brought up the hillsides and even onto the steeper slopes, where only hand labor can be utilized.

Sandy soils, gray and red, light loams and chocolate loams, sandy clays of all degrees of texture, gray alluvials, and black alluvials are the types of soil where sugar cane is grown. The prevailing soil in Natal is a red or chocolate, ferruginous, sandy loam, of light texture, easily worked once it has been broken up. A practice recommended to cane growers, and often followed, is to apply fertilizers in a furrow from 6 to 9 inches deep at each side of the cane row, about 12 inches from the stools. There seems to be no combined plow and fertilizer sold in Natal that will perform this operation, and this appears to be a matter deserving the attention of American manufacturers.

Irrigation is seldom resorted to on account of the hilly nature of the country, but there are a few sections where the natural rainfall can be supplemented by artificial means, making it feasible to harvest an annual crop instead of a biennial one; this also opens up wide possibilities as regards the choice of varieties of cane. Natal grows sugar cane with a rainfall of about 40 inches per annum, whereas 100 inches of rainfall is considered necessary in tropical countries in order to produce it successfully.

PLANTING.

The general time for planting sugar cane is August and September, though planting may be done as late as December and January. The rows are placed from 4 to 6 feet apart, according to the richness of the soil, and from two to four cuttings 6 to 18 inches apart

are planted in the drills. The land is either drilled with a plow 9 or 10 inches deep or it is holed out in straight lines. In some cases the plow is first used at a depth of 6 inches, and it then returns along the same furrow cutting 4 inches more, making a furrow 10 inches deep in all. In this way the seed canes have an excellent bed of loose earth around them, since in the second plowing a good deal of loose soil falls in the furrow. After the cuttings are laid in the holes or trenches, they are loosely covered with about an inch of soil. As the young shoots grow up, the covering of soil is increased until the holes or drills are filled.

CULTIVATING.

A great deal of cultivation is done by hand, but small plows and scarifiers are also largely used. When the cane comes up it is generally hand weeded and hand hoed until it is 2 feet high. If the lay of the land permits, it is from that time cultivated with horse hoes and scarifiers, as long as the animals can get between the rows.

HARVESTING.

It takes from 20 to 24 months for the cane to be ready for harvesting. The canes are cut with hatchets, or cane knives, as close to the base as possible. Cutting begins in April and continues until December. The scarcity of labor often causes the harvesting period to extend over nine months. Thirty tons of cane per acre are considered in Natal a good crop, although on new lands as many as 60 tons and more are obtained. The average for Natal plantations, however, probably does not exceed 30 tons. Sugar cane delivered at the mills is worth from $3 to $3.50 per ton, which, after deducting expenses, leaves from $2 to $2.50 for the grower. When manured, good crops of sugar cane are ordinarily obtained for from 10 to 15 years without replanting. There are about 40 sugar mills at work in Natal, besides a large refinery, and these employ a total of about 10,000 persons.

The Natal sugar industry is undoubtedly enjoying a solid prosperity, altogether apart from any influence emanating from the war. Cane cultivation has substantially increased the price of the coast lands of Natal, but not beyond their intrinsic value. If the recommendation of the West India Committee to establish a preferential customs tariff in favor of sugar grown in British colonies is adopted, there should be considerable scope for Natal to increase the area of its land under sugar, as such action would make it possible to look forward to an export trade after the local market has been taken care of. There is, perhaps, no country in the world where land can be put under sugar cane so cheaply as in Natal and Zululand. What it costs in other countries to clear the land for cane is often the price of land in Natal planted with sugar and generally improved. Sugar growing is one of the few industries in South Africa at present that offers an opportunity for close settlement, especially when dairying is taken up in connection with it.

BEET SUGAR.

The possibilities of establishing a sugar-beet industry are being tested. Seeds have been distributed by a prominent Oudtshoorn landowner to farmers in the George and adjoining districts, and the

results obtained show that these produce beets with a percentage of sugar amounting to more than 15 per cent, which is the average sugar content insisted upon by European manufacturers. All experiments made thus far have been satisfactory, but there is little likelihood that a factory to handle the crop will be erected before the termination of the war. It is felt that large areas of irrigated Karroo land could be profitably devoted to the growing of sugar beets.

TOBACCO.

Tobacco growing is largely engaged in throughout South Africa, and large areas of land are now devoted to this crop. In the older tobacco-producing districts the area given over to it is rapidly increasing. In 1911, 19,200 acres were under this crop, which produced 14,961,199 pounds of tobacco. All the districts of South Africa, with few exceptions, contribute to this output. The value of South African tobacco exported in 1915 was more than $320,000, the bulk being pipe tobacco. There is a duty of $0.95 per pound on leaf tobacco imported.

The Union Government maintains a special tobacco division to promote the industry, and experimental stations have been established at Rustenburg, Barberton, Piet Retief, and Tzaneen. At all the agricultural colleges and experimental farms of the Union a great deal of attention is given to this crop. In addition to seed testing and demonstrations at the stations, members of the tobacco division are constantly traveling throughout the Union, advising farmers as to the best methods of growing and curing tobacco. The methods in vogue in the tobacco districts of the United States are closely followed in South Africa, American experts having been largely employed by the Union Government to foster this industry.

Black turfs and red loams are the types of soil generally selected. The average yield is given as 800 pounds per acre, and the prices obtained vary from $0.18 to $0.30 per pound. In the past all the tobacco grown in the Union, other than Turkish tobacco, has been air cured, but several of the more progressive growers are now adopting the flue-curing method for the production of the light-color leaf.

CAPE PROVINCE.

The acreage in Cape Province is 4,376 and the production 2,767,179 pounds. The chief producing districts are Oudtshoorn and Stockenstroom, which produce the Virginia type, and Paarl and Stellenbosch, which cultivate the Turkish variety. In the two latter districts the industry is making considerable progress, and the Western Province Tobacco Growers Co. (Ltd.), with a capital of $100,000, was formed about two years ago to prepare and market the crop, and it has so far handled 200,000 pounds of tobacco. Tobacco is grown to a greater or less extent everywhere in the Province, and it is estimated that the acreage under this crop has increased about 50 per cent since 1911. The Turkish tobacco grown around Paarl takes about two years to mature properly. The output has, so far, proved insufficient to meet local demands for it for cigarette making, and the manufacturers at Cape Town have recently indicated that they could use twice the amount that is now being offered.

NATAL.

The acreage in Natal is 1,050 and the production 2,685,037 pounds. Tobacco is largely cultivated in the Inanda, Lower Tugela, and Alexandra districts, the types grown being dark leaf for cigar wrappers and fillers.

ORANGE FREE STATE.

The acreage in the Orange Free State is 2,370 and the production 807,209 pounds. The Vredefort district is the chief producing center, the Turkish leaf being chiefly grown.

TRANSVAAL.

The Transvaal acreage is 11,405 and the production 7,701,774 pounds. The Rustenburg and Krugersdorp districts, where the famous Magaliesberg pipe tobacco is grown, contributed more than one-third of the total production of tobacco in South Africa, and the output of the Transvaal is more than half of the total output of the Union. This pipe tobacco is of very good burning quality, of mild flavor, and cool; it is much relished by those accustomed to it, who prefer it to any other.

The Transvaal tobacco industry has attained a degree of organization unequaled by any other agricultural industry in South Africa. The cooperative tobacco warehouse at Rustenburg is rapidly extending its operations, and in 1913 it handled nearly 4,000,000 pounds of tobacco. The average price received for light yellow tobacco was from $0.25 to $0.35 per pound and for pipe tobacco from $0.08 to $0.12 per pound.

COTTON.

Cotton is a crop suited to large areas of South Africa where irrigation is not available and there is only a moderate rainfall. The districts of Rustenburg, Marico, and Waterburg and the midlands and lowlands of the eastern sections of South Africa are considered to be suitable for the profitable cultivation of this crop. Natal and Zululand are said to offer great possibilities in connection with the industry, and the Agricultural Cooperative Union (Ltd.), of Pietermaritzburg, has made arrangements whereby cotton ginned and placed on board ship for export will be paid for at the rate of 75 per cent of the Government expert's valuation, the balance to be paid when the cotton is sold. This will remove one of the chief drawbacks to the development of the industry in Natal, for the farmers in the past did not regard cotton growing with favor on account of the uncertainty as to the time they would be paid for the crop.

Trial fields of cotton have been successfully grown in the warmer parts of the Transvaal, Natal, eastern Cape Province, Transkeian territories, Zululand, and Swaziland, and during the past three years many farmers have taken an interest in the cultivation of this crop. The varieties of cotton that have given the best results in South Africa belong to the American upland type. The average yield of the big-boll varieties is about 325 pounds of lint per acre, while the long-staple varieties produce about 225 pounds per acre. The cost of

production, including ginning and preparation for market, is about $15 per acre. South African lint is said to realize from 1 to 2 cents per pound more on the English market than American-grown lint of the same varieties of cotton.

The importance of cotton growing in South Africa lies more in the future development it promises than the extent to which the industry is prosecuted at the present time. The production of cotton has not thus far exceeded an annual output of 500,000 pounds of seed cotton. The chief of the cotton division is an American and so are the principal officers under his charge. A number of South African young men have studied in the United States agricultural colleges with a view to familiarizing themselves with the methods followed there in connection with cotton culture, so such practices as are in vogue in the United States have been adopted in developing this industry in South Africa.

Plowing for cotton in South Africa is done from 8 to 12 inches deep, to provide for a seed bed with a liberal moisture-holding capacity, and, in order that the planting may be early, plowing is done during the winter, when the soil unfortunately is dry and hard. Planting is done as soon after the spring rains as possible (generally during October), the distance between the rows being 40 inches, with one to three seeds drilled every 18 or 24 inches. From 10 to 15 pounds of seed per acre are considered necessary when the planting is done by hand and 18 to 25 pounds when it is done with a planter. Much cotton planting is done by hand, but cotton planters will no doubt be used extensively when the industry attains greater dimensions. An officer of the cotton division stated that in Natal in particular "the indications are that planting cotton with listers is very likely to come into great favor."

Cultivating is done in the same way as in the Southern United States, four cultivations during the growing period being considered necessary, and the single and double row cultivators are becoming much in demand for this purpose. Experiments made to determine the value of lime in connection with the growing of cotton have invariably proved that much greater yields are obtained when this is supplied, and no doubt lime distributors will be largely used in the future in connection with cotton growing. As regards harvesting, South Africa farmers are especially favored with a clear autumn and winter to harvest their crops, and the large amount of labor that may be made available for this industry, if proper inducements are given, should serve to solve the problem of picking cotton, which is so acute elsewhere. The system of paying the natives a certain fixed amount for every 100 pounds of cotton picked should meet with favor in South Africa, if established. So far, the average amount of cotton picked by a South African native in a day is 50 pounds, instead of the 125-pound average prevailing in the United States.

In one of the experiments made by the cotton division, 1,718 pounds of seed cotton per acre, with 32.3 per cent of lint, were obtained. The cost of production is given at $12.50 and the net profit at $54. The chief of the cotton division is authority for the statement that a Rustenburg farmer during the season 1914–15 planted 2½ acres with cotton and harvested 9,731 pounds of seed cotton, which he delivered

to the Cotton Cooperative Society of Rustenburg, receiving a check for $395. Another farmer spent $0.20 for cotton seed, which he planted on 1½ acres, and for his crop the society paid him $199.88. In a pamphlet published by the Department of Agriculture the following remarks are made regarding the yields of cotton obtained in South Africa:

> Tests made here of the yield of seed cotton produced from a given number of selected bolls compare favorably with those of any cotton country. In 1910, at our Rustenburg station, we obtained 1 pound of seed cotton from 43 bolls, and last season we had 8 varieties to come under this record, the lowest being 34 bolls to produce 1 pound of seed cotton. In a similar test, made and reported at the North Carolina (United States of America) Experiment Station in 1907, out of 45 varieties, the least number required to give a pound of seed cotton was 58 and the greatest number required was 92. This is very encouraging to us, as well as an indication of the possibilities of the cotton industry in South Africa.

To encourage the growing of cotton in Natal the Government recently erected a small ginning plant in Durban, consisting of two roller ginning machines and a baling press. Ginning plants are also operated by the Government at Tzaneen and Rustenburg. There are also privately owned ginneries at Durban and at Manelane, Transvaal. The Chamber of Commerce at East London also operates a ginnery. The weight adopted in South Africa for bales of cotton is 220 pounds, but as the industry attains greater importance bales of 500 pounds, to conform to the American standard, will probably be made. The Department of Agriculture is now considering the erection of a cotton-seed crushing plant and the manufacture of cotton-seed cake, which should give a great stimulus to the cotton-growing industry. Several Government experiment stations have grown cotton successfully for the past six years and have proved that cotton will, if given good cultivation, produce paying crops. The cotton grown at these stations in 1913 amounted to 140,000 pounds of lint, which was sold on the English market at prices ranging from $0.15 to $0.16 per pound when American cotton was selling at approximately $0.12 per pound. The 1915 crop was sold to the South African Woolen Mills Co., Woodstock, Cape Province, which operates 1,500 spindles and uses from 300 to 400 pounds of lint per day, at the price of $0.14 per pound.

The Cooperative Society at Rustenburg has a ginning plant, and during 1915 it shipped 417 bales of cotton. The gins there are saw gins and capable of producing between 2,000 and 3,000 pounds of ginned cotton per day.

As native labor comes to be better appreciated and is handled with tact and encouraged to regard and respect work as a duty, it should be possible to turn to account on an extensive scale the latent energies of the colored race in connection with the growing of cotton.

Cotton is advocated as a good rotation crop with maize and leguminous crops and for those sections of the country where maize can not be grown for the want of a few more inches of rainfall.

VITICULTURE.

Owing to climatic conditions, the commercial cultivation of the vine is practically confined to the western Cape Province, the only part of South Africa that receives the rains during the winter months

of the year. The other parts of South Africa obtain the rains in summer, when the crops come to maturity and when a continuation of wet weather may spoil the grape crop completely.

In 1911 there were 59,622,622 bearing vine stocks and 9,121,852 nonbearing vine stocks in the Union, the number outside Cape Province being less than 1,000,000 vine stocks. During 1911, 621,543 gallons of brandy (1,662,868 gallons in 1915), 5,468,032 gallons of wine, 32,167 gallons of vinegar, and 2,524,826 pounds of raisins were made. The total crop that year was 5,753,682 bushel baskets of grapes, of which 1,348,957 bushel baskets were not made into either brandy, wine, or raisins. In 1912, $170,000 worth of grapes were exported, but in 1915 only $60,000 worth—probably owing to the high cost of freight and the scarcity of ships. About $105,000 worth of South African wine and $66,000 worth of brandy were exported in 1915. In 1904 there were 35,000 acres of land planted as vineyards and in 1911 36,235. It is estimated that about 1,000,000 vine stocks have been planted annually during the last few years, and, judging from the increase in the production of brandy and the larger local demand for Cape wine in recent years, the present acreage planted with vineyards must be substantially larger.

The most important viticulture centers are Paarl, Stellenbosch, and Worcester, but the vine is also extensively cultivated in the other districts in the southwest of Cape Province. Karroo soils produce wine in an abundance almost unknown in any other part of the world. Generally accepted figures show that on some farms more than 600 gallons of wine are produced from 1,000 vines, this production being far in excess even of that of the French vineyards.

Disk plows are quite generally used to plow the land before planting, being set to plow at the utmost depth their construction permits. After plowing, trenches 2 or 3 feet deep are made with hand tools. Deep, loose, friable loams, on a gentle slope to allow good drainage, are the lands preferred by South African farmers for vineyards. Planting is done during the first days of August. Perhaps the most common distance at which vines are planted is 4 by 6 feet. In the winter the vineyards are plowed about 6 inches deep with a vineyard plow for the purpose of loosening the soil and destroying weeds. This operation in the past was often done by hand with spades and forks, as hand digging is preferred by the farmers. The scarcity of labor, however, has made the use of one-horse plows and scarifiers more general in recent years. Cultivation is done in the summer to keep the soil loose and open, to destroy weeds, and to preserve the natural moisture of the soil. Where 20 inches of rain are obtained irrigation is not considered necessary if adequate cultivation of the soil is practiced. Cultivation is continued until the grapes start coloring. Because the work is chiefly done by natives it is very important that the plows, horse hoes, and scarifiers (particularly the last mentioned) should be so constructed that all braces connecting the frame with the handle project as little as possible, so as to prevent the braces from striking the young grapes and damaging them.

Animal and vegetable manures are often buried in the center of the rows about 18 inches deep. For this purpose a furrow is made with the plow, which, if it does not go deep enough (as is often the case), is followed by natives with spades in order to obtain the

required depth. A narrow-cut plow to perform this operation would no doubt become popular among the viticulturists of South Africa. An abundance of lime is necessary in soils where vines are planted, and, since South African soils are very deficient in lime, there is undoubtedly a good opening also for a ground-lime distributor, of an adequate width and for one horse, to distribute lime as a dressing in vineyards at the rate of from 1 to 2 tons per acre.

A great hindrance to the proper development of viticulture in South Africa in the past has been the enormous fluctuation in the price of wine and brandy from year to year and the want of a foreign market. When the preferential tariff in favor of Cape wines was abolished by England in 1866, the exportation of wine dropped to about one-tenth of what it had been before. In 1856, 720,209 gallons of wine were exported, whereas in 1915 the amount was 82,564 gallons. Since 1905 the Government has energetically worked to improve the wine industry, and cooperative wineries under Government supervision, provided with modern machinery and methods of fermentation, have been established. An Oenological Institute was founded at Elsenburg in 1913, with the object of studying and distributing levures and dealing with ferment, etc. There is much evidence that South African viticulture is now in a satisfactory condition. The poorer vintages of the last season in southern Europe and northern Africa, which doubled and trebled the price of wine in Europe, stimulated the export trade of Cape wines. In the first six months of 1916 the value of the wines and spirits exported by South Africa was more than six times as great as during the corresponding period of the previous year. The advanced legislation against the adulteration of liquor is also expected to assist in creating a name and a demand for South African wines and brandies overseas. Whereas the import duty on spirits is $5 per proof gallon, South African wine and brandy of no higher strength than 22 o/p pays an excise duty of $1.25, and when of a higher strength it pays $2.50 per proof gallon.

The union's trade commissioner in London recently reported on the excellent opening that exists at present for the sale of Cape wines and brandies in England, and advised South African producers to make as large shipments as possible of such types as can take the place of those to which the English public is accustomed. It is not unlikely that after the war England will grant a rebate on duties imposed on wine produced in the British colonies; such a measure should benefit the South African viticultural industry in particular.

FRUITS.

Fruit growing on a commercial basis, having as its object the building up of an export trade, may be said to have derived its initial impetus from the late Cecil Rhodes. Toward the end of the last century Mr. Rhodes caused a quarter of a million deciduous fruit trees to be planted in Paarl, Stellenbosch, and Wellington, in the Cape Province. The result of these plantings was an export trade with England during the first years of this century that, from small beginnings, has now approached half a million boxes annually. The

following table, although applying to the census of 1911, will give an idea of the classes of fruit chiefly grown in Cape Province:

Kinds of fruit.	Number of trees.	
	Bearing.	Not bearing.
Peaches	1,156,387	261,639
Apples	464,250	239,365
Oranges	281,133	187,882
Apricots	306,975	73,231
Pears	239,997	149,632
Plums	283,119	93,265
Nectarines	25,908	15,877
Total	2,757,769	1,020,891

Practically all other fruits are grown, although on a small scale.

Grapes were, perhaps, the first fruit to be exported, and the success attending the early experiments, synchronizing as it did with the establishment of the Rhodes fruit farms, soon induced other farmers to turn their attention to the oversea markets, not only for grapes but for other fruits. The exports of South African fruit for three recent years were as follows: Fresh fruit—1913, $1,261,735; 1914, $2,293,800; 1915, $1,551,950. All other—1913, $15,915; 1914, $123,245; 1915, $520,835. Total—1913, $1,277,650; 1914, $2,417,045; 1915, $2,072,785. The decrease of exports in 1915 may undoubtedly be accounted for by the high ocean freight rates and scarcity of tonnage.

The growing and exportation of oranges are increasingly occupying the attention of farmers. Oranges can be produced in many districts throughout the Union, especially near the coast, although the best coastal fruits are produced some 12 miles inland, or have an intervening mountain range between them and the sea. Most excellent oranges are grown at Fort Beaufort, Oudtshoorn, and in other southeastern districts, while in the western part of the Province Clan William and surrounding districts are famous for the fine type of oranges produced. South Africa, being in the southern hemisphere, has the advantage that the season for the ripening of oranges synchronizes with the summer in Europe. When Europe is at its hottest this most refreshing fruit can be put on the market and, owing to the modern methods of transportation and packing, arrive in a fresh and juicy condition. It is stated on good authority that in the next two or three years 1,000,000 boxes of oranges will be available for export, and this figure is likely to be doubled three or four years thereafter. The rate at which orange trees are now being planted is estimated at 100,000 per annum. Washington, Naval, and Valencia Late are the varieties chiefly grown, and Californian methods of cultivating orange groves are closely followed in South Africa, irrigation also being often resorted to.

Another type of fruit that is being grown chiefly with an eye toward the export trade is pineapples. The districts near Grahamstown, especially Bathurst, have a large acreage planted with pineapples. The rainfall is 26 inches per annum, making irrigation unnecessary. Two crops are produced every year, one in winter and the other in summer, and the chief of the division of horticulture

states that a conservative estimate would give $1,000 per acre per annum as a fair return for pineapples grown in that district.

Land suitable for pineapples can be obtained at $50 per acre. The pineapples are planted in rows 5 feet apart, and there is an opening for cultivators whose construction will permit cultivation of the land between the pineapple rows, covering the full width of the row at the beginning and susceptible of being adjusted to a narrower width to cultivate the soil after the pineapple plants have grown to a point where the free space between the rows becomes smaller. The Queen variety of pineapple, a small type weighing less than 20 ounces, is chiefly grown, and the prices realized by farmers, while varying greatly in normal seasons, are about $1.50 per dozen. This particular pineapple is very hardy and carries well for export. Besides the supplying of the local market, several thousand cases have been exported during recent years, and the Union's trade commissioner in London some time ago cabled for shipments of 1,000 cases weekly; thus far the pineapples have not gone forward in anything like the quantity asked, and this fact speaks well for the chances of greatly extending this industry.

Natal also produces fine pineapples, but it does not appear that they are grown as much for the export trade as is the case in Bathurst and adjoining districts. The fruit grown is much softer and consequently not so suitable for export.

In addition to the increasing quantities of deciduous fruits exported, it is necessary to consider the large local demand in order to appreciate the present extent of this industry. Hitherto the southwestern districts of Cape Province have been the chief producers of this type of fruit. It is estimated that the consumption of deciduous fruits in Johannesburg and its immediate surroundings is much in excess of $500,000 per annum. Outside of the southwestern districts of Cape Province, no deciduous fruits are produced for the foreign trade, but it is anticipated that before long an export business will develop in connection with the apple industry, which has been making great strides in the Orange Free State and the eastern portion of the Transvaal.

Until recently South Africa depended a great deal on foreign supplies of dried, preserved, and canned fruits, despite the fact that the country produced most excellent fresh fruits of all kinds. Even during the year 1915 no less than $350,000 was sent abroad by South Africa in payment of importations of these classes of fruit. The southwestern districts of Cape Province are undoubtedly quite able to supply a first-class article so far as quality is concerned, but it seems necessary first to break down the prejudice against the preserved fruits of that district arising from the class of labor used. As a better knowledge is obtained of factory sanitation and of all phases of the manufacture of preserved fruits the situation will assuredly improve. This industry has been benefited by war conditions, which have enhanced the local demand because of the scarcity of supplies from overseas and transportation delays and difficulties. The development of the sugar industry of Natal will no doubt be a stimulating factor in expanding this industry.

One of the chief difficulties encountered in connection with the exportation of South African fresh fruits has been the expensiveness

of fruit boxes; nearly $1,000,000 is spent every year for fruit boxes, but the manufacture of boxes of wattle wood has recently been started, and this is likely to result in lowering the cost of this article to the farmers.

In order to encourage the development of fruit export trade the Union Castle Steamship Co. grants very low rates, and it has made provision for adequate cold storage in each steamer, these facilities being enlarged as the trade increases.

ALFALFA.

According to the census of 1911 there were at that time 154,575 acres of land in the Union devoted to alfalfa growing. On every farm where conditions are favorable, whenever irrigation can be resorted to, this crop is cultivated. Alfalfa is a great favorite with South African farmers, and since the census was taken there has been a very substantial increase in the area devoted to it. It is estimated in some quarters that during that time the acreage under alfalfa has been doubled. Arabian and Province varieties of alfalfa are perhaps those most widely grown. The yields vary greatly, the average being about 1½ tons per annum per acre. The Karroo districts are those in which this plant is most extensively grown; it is the chief crop in those sections devoted to the rearing of ostriches, alfalfa being the staple food for their maintenance. Cape Province grows about 80 per cent of the alfalfa produced in the Union. In the Oudtshoorn district very big prices have been paid for alfalfa land—as much as $1,500 per acre in some cases.

It would appear that the possibilities of selling some of the improved alfalfa tools produced in the United States are fairly substantial. Mowers and hand and self-dump rakes are used in great numbers, as well as hay presses. Little progress has so far been made, however, in inducing the South African farmers to use side-delivery rakes and tedders. Owing to the intensity of the sun, which quickly cures and drys the hay after it has been cut, it is felt that quick handling of the crop is essential to obtain uniformity of curing; otherwise the top of the cut rows of alfalfa becomes extremely dry, while the hay underneath is still too green and unfit to be stacked. Hay loaders, sweep rakes, and stackers could be sold in fair numbers if steps were taken to familiarize the farmers with the advantages derived from using these valuable machines.

Teff grass and paspalum are also popular grasses in South Africa. It is estimated that more than 50,000 acres of land are devoted to their cultivation. Under ordinary conditions teff grass will produce from 2 to 3 tons of hay per acre in a single cutting, and three cuts per year are often obtained. It is often grown as a dry-land crop.

For many years past alfalfa cultivators built with a frame similar to that of a disk harrow, and with a revolving set of spikes instead of disks, were used in large numbers to cultivate alfalfa and other grasses. Owing to the hardness of the soil, however, it was ascertained that in a great many cases the points of the spikes became dull, and under those conditions they would press the short alfalfa heads into the ground, instead of loosening the soil around the plants as was intended. Disk harrows, therefore, have lately been more largely used for that purpose. Any machine or device

produced to cultivate alfalfa is certain to find a ready and substantial market in South Africa, and if the quality of the work is satisfactory price would be a minor consideration in the adoption of such machinery.

TEA.

Of the 5,000 acres of tea grown in Natal, the only Province where this plant is cultivated, about 4,250 acres are in the district of Lower Tugela. Alexandra, Inanda, and Lower Umzimkulu are the only other districts where tea is grown. The production in 1911 is given as 2,140,000 pounds of green tea. Owing to the stoppage of Indian immigration, there is a tendency to abandon the cultivation of tea rather than to increase the area. A fairly large proportion of the crop is shipped to London for blending purposes. Since a tea field does not require replanting for about half a century this crop is unimportant so far as the sale of farm machinery is concerned.

POULTRY AND EGGS.

More than $1,000,000 worth of eggs were imported in 1907, whereas less than $100,000 worth were imported in 1915. In 1915 poultry valued at a little more than $100,000 was exported. Until recently there was only one poultry expert attached to the Government service; five are now employed. The poultry industry is making good progress, and a substantial export trade in both poultry and eggs is likely to be established in the near future. Relatively speaking, a fair business in incubators and other requisites connected with poultry farming is being done in South Africa.

PIGS.

Owing to the intense summer heat the curing of bacon must be confined to three or four winter months. The value of the ham, bacon, and salted meats imported has been uniformly maintained at about $1,000,000 per annum for the past five years. According to the census of 1911, the number of pigs in the Union had increased by about 60 per cent since 1904. Much attention has been given to pig raising in the past few years, and it is not improbable that South Africa will shortly provide for its own requirements in that line.

TRUCK FARMING.

With the exception of potatoes, the growing of vegetables is limited to the production of the supplies necessary for the large centers of population, and the industry is in the hands of Indians, Greeks, Germans, and Italians. Only the most simple tools are used, since very small plots of land are cultivated by an individual. It is estimated that the total receipts of the produce sold in Johannesburg market amount to about $4,000,000. Potatoes are, in a few cases, grown on a larger scale, but the trade in potato machinery is insignificant, one of the larger firms in the trade stating that it sells less than a dozen machines per annum. About 60,000 acres are planted yearly with potatoes. It is probable that this business will show a gradual improvement in the future.

WATTLE BARK.

The production of wattle bark is an industry of the greatest importance to the Province of Natal, and one that is rapidly increasing

in magnitude. At the beginning of the war, unfortunately, wattle-bark growers lost the German markets which for years had absorbed almost the whole of their product, and for a time the outlook was far from bright. During the latter months of 1914 efforts were made to find outlets in England, and since the beginning of 1915 the situation has considerably improved, this change having been aided by the fact that bark buyers have been found in America and Russia, to which countries many thousand tons of bark have been shipped during the last year or two. The prices obtained have also been fairly satisfactory, although it appears that the price of bark has greatly declined as the supplies have increased. In 1904 the average price was $48 per ton; in 1910, $40.50; and in October, 1914, $38.25.

In view of the difficulties in marketing chopped bark, such as has ordinarily been sent by South Africa heretofore, a factory is now being installed to make solid extract from wattle bark, and this will undoubtedly assist very greatly in the development of this industry. The Natal Agricultural Cooperative Union (Ltd.), among the membership of which are found the principal owners of wattle plantations, is behind the project.

Approximately 250,000 acres are planted with wattle in Natal. The exports in 1912 amounted to 59,110 tons, valued at about $1,415,300. The chief market before the war was Germany, the tanneries of Great Britain requiring the tanning material in the form of extract. Consequently, the market, as already stated, became dislocated at the time of the outbreak of hostilities, and in 1915 only 44,830 tons were exported, valued at about $976,200. The industry is evidently recovering at the present time, as during the first six months of 1916 the exports of wattle bark increased nearly 100 per cent over those for the corresponding period of the preceding year.

The question of utilizing the waste wood of wattle plantations for the distillation of acetic acid, alcohol, and other products is being considered at the present time, and if this project materializes, as is practically certain to be the case, the industry will unquestionably benefit greatly. There is not much trade in agricultural machinery and implements in connection with the wattle-bark industry. The machinery used for extracting the tanning contents of the bark is of a class not included in strictly farming machinery.

DAIRYING.

The early history of creameries in South Africa was somewhat discouraging, but of late the dairying industry has been placed on a much sounder footing. New creameries are springing up in different districts, and, whereas 10 years ago it is doubtful whether there were more than 5 creameries in the Union, to-day there may be 50, about equally divided between privately owned and cooperative establishments. Twelve of the cooperative creameries received grants from public funds to assist in their establishment, the money being advanced on the dollar-per-dollar basis, repayable by installments and carrying a reasonable rate of interest. One group of cooperative creameries in the Orange Free State sends about 1,000,000 pounds of butter to the Johannesburg market every year. The establishment of these creameries has done the farmer much good, for whereas in the old days he could market only a small amount of butter, to-day he can sell as much butter fat as he can produce at a remunerative price.

A considerable portion of the Union is well adapted to dairy farming. The climate is mild, and cattle thrive well on the natural vegetation for six to eight months of the year. The dread of disease has to a large extent been overcome by dipping the cattle, while the numerous irrigation schemes that have been and still are being undertaken are proving of great assistance in enabling dairy farmers to grow forage crops for winter consumption and to carry the stock over times of drought. The principal crops grown for feeding dairy cattle in the Union are maize, alfalfa, oats, teff grass, mangels, rye, and cowpeas. The value of ensilage is beginning to be realized, and silos are increasing in number in all parts of the country.

The Department of Agriculture is doing a great deal to assist the development of the dairy industry and has established a division of dairying consisting of a superintendent of dairying and six inspectors. In each of the four Provinces of the Union a dairy instructor is stationed whose duty is to travel among farmers and give instructions and advice in approved methods of production and other matters pertaining to dairying. Lectures and demonstrations are given by officers of the division at suitable places, including agricultural shows, on butter and cheese making as well as milk and cream testing. The Government has now under consideration the granting of financial assistance to milk-record and cow-testing societies, and it is hoped that this will encourage the establishment of dairy cattle in the Union.

The superintendent of dairying made an extensive tour of Australia and New Zealand in 1914 with the object of acquiring information regarding the systems in vogue there in connection with the exportation of dairy produce; this indicates that the Government feels that the Union will soon be able to enter the dairy export trade. A special course in dairying has recently been instituted at the Grootfontein Agricultural College with the object of fitting young men for the industry. A traveling dairy and the provision of educational facilities to train women in the making of dairy products has recently engaged the attention of Parliament, and Premier Botha, in a debate on the question, discouraged the exportation of maize and advocated its wider use to build up the dairy, pork, and meat industries of the country.

There were 1,900,230 dairy cows in the Union in 1911, according to the census of that year. Generally speaking, they produce rather a small quantity of milk, but of very good quality. The annual quantity of milk produced per cow naturally varies greatly with locality and season, averaging probably for the whole of the Union something under 200 gallons, while the average quality is probably about 3.5 per cent butter fat in the milk. During the last few years a number of pure-bred cattle have been imported into South Africa, the Union Castle Steamship Co. carrying them in its steamers from Europe free of freight charges. Numbers of progressive farmers are building up first-class dairy herds, some of which average a milk yield of 800 to 1,000 gallons per cow per annum. In grading up native stock, with a view to increasing the size and milk production, bulls of the Shorthorn, Friesland, and Ayrshire breeds are generally used.

The chief causes that have restricted the progress of this industry in the past, such as inefficient and inexperienced native labor, un-

familiarity of the farmers with the proper methods of handling the milk and cream, the low type of dairy stock, and the high cost of running the creameries, are gradually being removed, principally as a result of the effective support given by the Government to all the measures tending to bring about improved conditions in the industry. It is agreed in South Africa that there is a great future for that country in connection with the dairy industry, and it is anticipated that at no very distant date the Union will take a place among the large exporters of dairy products. Two experiments in butter exportation were made in 1914 to London, and one of the consignments was reported as unsurpassed by butter from any other British dominion. The importation of dairy utensils in 1915 was larger than in the preceding year, this being the only item among the requisites for agriculture showing an increase during that year.

The production of butter in the Union for the year 1913 is given as 10,741,745 pounds (valued at about $260,000), as follows: Produced by creameries, 7,659,748 pounds; produced by farmers and sold on markets, 2,237,219 pounds; produced by farmers and sold to merchants, 844,778 pounds.

During that year 10,085,139 pounds of cream and 5,232,848 gallons of milk were sold. The imports of butter, which amounted to 11,127,139 pounds in 1906, decreased to 2,026,258 pounds in 1915, and 96,570 pounds were exported during the latter year. The total value of butter and cheese imports in 1903 is given as $5,460,213, whereas in 1915 it was only $1,350,258.

The production of cheese in 1913 is given as 520,849 pounds, valued at $92,000. In 1914 605,686 pounds of cheese, valued at $133,000, were produced. In 1915 3,966,269 pounds of cheese were imported, representing a decrease of about 35 per cent as compared with the preceding year.

There are about 50 small cheese factories in the Union at present, the principal varieties manufactured being Cheddar and Gouda. This branch of the industry is also receiving considerable attention; new factories are being established, and a greatly increased output is expected in the immediate future.

CATTLE.

The following table (census of 1911) shows the number and percentage of cattle in the Union in the possession of (1) persons of European or white race, (2) other than European or white:

Provinces.	Race.	Total.	Bulls.	Cows.	Oxen.	All others.
Cape Province	Whites..	1,186,620	25,427	372,082	327,554	461,547
	Others..	1,528,710	40,667	535,241	445,791	507,011
Natal	Whites..	244,011	5,686	78,734	47,854	111,737
	Others..	212,076	9,988	62,657	30,525	108,906
Orange Free State	Whites..	1,031,014	19,346	305,658	293,016	412,994
	Others..	255,220	5,305	75,298	75,914	98,703
Transvaal	Whites..	864,087	19,552	279,523	278,391	286,621
	Others..	475,211	19,587	191,037	121,321	143,266
Total	Whites..	3,325,732	70,011	1,035,997	946,825	1,272,899
	Others..	2,471,217	75,547	864,233	673,551	837,886
Grand total	.....	5,796,949	145,558	1,900,230	1,620,376	2,130,785
Percentage	Whites..	57.37	48.10	54.52	58.43	59.74
	Others..	42.63	51.90	45.48	41.57	40.26

In 1904, according to the census of that year, there were 3,500,453 head of cattle in the four Provinces of the Union; in 1911 there were 5,796.949, an increase of 65 per cent in seven years. In the Cape Province the increase was 39 per cent. In Natal there was a decrease of 31 per cent, due to the ravages of East Coast fever, now practically stayed. In the Transvaal the increase was 160 per cent, and in the Orange Free State it amounted to no less than 254 per cent. The mortality of cattle during 1911 was 437,873, or a little over 7½ per cent. It is officially estimated that at the beginning of 1916 the cattle in the Union numbered about 8,000,000.

There is perhaps no country in the world in which such an increase of cattle has taken place during the period under review, and this fact is the more remarkable in view of the ravages of East Coast fever in certain parts of the country. In part it is due to the preservation of practically all animals capable of breeding and to the large number of high-class animals imported for breeding purposes. Also, more care has been taken of both the imported and the native animals, with the result that the general standard of the live stock throughout the country is much higher than it was. Considering both the increase in numbers and the improvement in the quality, South Africa may be well pleased with the progress made in the last 10 years. This improvement is strongly reflected in the almost entire cessation of imports of beef and mutton, as shown in the following figures: 1903 (excluding the Orange Free State, for which no figures are available), $14,139,852; 1906, $3,683,940; 1914, $107,188; 1915, $3,542.

The average number of cattle per head of population in 1911 was as follows: Cape Province, 1.06; Natal, 0.38; Orange Free State, 2.44; Transvaal, 0.79; and for the entire Union, 0.97. The number of cattle per square mile in 1911 was: Cape Province, 9.80; Natal, 12.92; Orange Free State, 25.53; Transvaal, 12.13; and for the entire Union, 12.25.

The districts in Cape Province having between 50 and 100 cattle per square mile were East London, Glen Grey, Herschel, King Williams Town, Komgha, Peddie, Stockenstroom, and Victoria East. Practically all districts in the Transkei are in this category. Albert is the only district in Natal with such an average, while in the Transvaal there are Boksburg, Germiston, and Johannesburg (probably because of their mining population), and, in the Orange Free State, Ficksburg and Ladybrand. The district of Nqamaqwe, in the Transkei, had the greatest number of cattle per square mile, the average being 92.93. The value of cattle hides exported in 1915 was $2,814,107. An increasing number of hides are converted into leather in the tanneries of the Union.

Increasing attention has been paid during the last 10 years to the improvement of both beef and dairy herds, and already a marked advance is noticeable. The example set by the Government has stimulated private owners to take up the breeding of improved stock, and during the past three years a stimulus has been given to the movement by the importation of large numbers of pedigreed stock from Europe, made possible by the willingness of the Union Castle Steamship Co. to carry free of freight from England all pedigreed stock intended to improve the South African herds. Since the initiation of this scheme, the following importations of pedigreed

stock have taken place: 200 stallions, 135 mares, 1 pony, 668 bulls, 298 cows, 1,185 heifers. 21 calves, 57 boars, 123 sows, 107 rams, and 1,020 ewes. The estimated freight on the above stock, had it paid the ordinary rate, would have been about $230,000.

For beef purposes, Shorthorn, Hereford, Sussex, and Aberdeen Angus breeds are chiefly used to improve the local herds. The Shorthorn is used where the land is good, the pasturage luxuriant, and the climatic conditions favorable. It is seen most often in western Natal and the eastern uplands of Transvaal and Orange Free State Provinces. The other three breeds have shown that they possess more hardihood than the Shorthorn and are therefore better suited to the areas where less favorable conditions prevail. The Hereford has proved its suitability in the higher land of eastern Transvaal and the Transkei territories. The Sussex is very popular in northern Transvaal and in Rhodesia, where the best strictly ranching areas of South Africa are situated. The Aberdeen Angus is gradually finding favor in Natal. Friesland, Ayrshire, and Jersey breeds are most extensively used for dairy purposes. Under good management Frieslands are bred in the Union worthy of the finest specimens of this breed. Where no proper attention is as yet given to feeding and shelter, a great deterioration in size and quality is to be found in many herds of Frieslands in South Africa. The Ayrshire proves adapted to less favorable conditions, where the soil and herbage is rather poor. Jerseys are very popular in the southwestern districts of Cape Province, where climatic conditions approximate those of their native land. Red Lincolns, South Devons, and Red Polls are also well-known breeds in South Africa as dual-purpose cattle.

The Africander is a pure breed of ancient lineage. It is one of the indigenous breeds of the country. It should not be confused with what are often called "Africanders"—a mongrel breed, nondescript cattle that are of no special value for any particular purpose. At the present time it produces the best ox for draft purposes, and may be classed as a beef rather than a dairy type. It possesses qualities of hardihood and powers of maintaining its flesh under adverse conditions to a greater degree than breeds introduced from abroad. This is what might be expected, for the breed is to-day largely the result of the survival of the fittest. As a pure breed in the hands of skillful breeders, it can be turned to great account in cattle breeding in many parts of the country. The Africander is of a uniform red, like the Devon, has a massive frame, and is built on rather graceful lines. There are districts outside the coastal belt where pure-bred cattle do not thrive satisfactorily, and it has been found that crossing these breeds with the Africander strain has very considerably added to the hardiness of the cattle and greatly reduced the mortality.

It is estimated that the investigation and control of the diseases of stock and plants cost the Government of South Africa more than $1,000,000 per annum, or roughly 80 per cent of the total expenditure of the Department of Agriculture. Since the Union was founded, in 1910, the country has probably spent $5,000,000 for this purpose. The East Coast fever in cattle and scab in sheep are particularly annoying, and it is deplorable that in a country like South Africa, where there is so much to be done to put farming in line with the progressive countries of the world, and where money is so scarce,

these two diseases should make necessary the expenditure mentioned and, indirectly, many times that amount.

If every farmer did his duty they could be completely eradicated in a very short time. The regulations for that purpose are most excellent, but individual slackness and unresponsiveness are great obstacles in the path of those who wage war against live-stock diseases. Much remains to be done, but a great deal has been accomplished in the last few years. Dipping of cattle and sheep is almost universally practiced, and as the country becomes more closely settled the custom of pasturing the stock in the highlands in the summer and trekking to the warmer lowlands in the winter is rapidly disappearing. This custom has often been the means of spreading disease, as in thus moving the cattle if they carry disease it is spread throughout the country they traversed. The better feeding of cattle has no doubt also helped to keep back disease. When no winter feed was available a large percentage of cattle grew up stunted from the time of birth on account of lack of food, and for that reason more liable to suffer in the event of disease attack. For this reason farmers are often met nowadays who deprecate the exportation of South African maize, as they claim that all the grain exported can be used much more profitably in providing the stock of the country with the food and nourishment they require.

MEAT EXPORT TRADE.

South African public opinion has been powerfully moved during the past three years on the subject of the meat export trade. The interest manifested has been remarkable. The outbreak of war in August, 1914, hastened matters considerably and has been responsible in no small measure for the progress already made. The enhanced prices realized for frozen beef since the beginning of hostilities have undoubtedly encouraged the promoters of the trade and more frequent and heavier shipments have been made from South Africa to London than would have been attempted under normal conditions.

The number of cattle available for export after the needs of the Union are served can hardly be estimated, but there is reason to believe that a surplus already exists and that within a few years it will be very large. The herds of cattle have increased greatly, both in number and in size. In comparing the cattle census of the Union with that of the other meat-exporting countries it should be borne in mind that in South Africa the animals constituting the natural increase of the herds have been kept for the fuller stocking of the farms on which the animals are bred or sold to persons occupying farms in process of development, and that they have also been used for transport purposes.

The first exports worth recording of South African meat took place in 1914, when meat of a value of $202,918 was shipped. In 1915 these exports increased to $744,288, and had there been more shipping available a much larger figure would be shown. An order for 40,000 quarters of beef was placed during the early part of 1916 with a South African firm, which is a record meat order for South Africa. The reports made by experts on the London meat market have revealed deficiencies in South African consignments in respect to slaughtering, dressing, and freezing. Some of the defects have

already been remedied, and with added experience and greater skill in butchering they should be entirely removed. In respect to quality, South African shipments of beef have varied very considerably. On some favorable comments have been made, but on others reports indicate that the quality leaves much to be desired. Younger beasts are required, animals not employed for working purposes and artificially fed when the pastures are poor. On the whole, the shipments made thus far are said to compare favorably with the pioneer shipments of Australia and Argentina, and several smaller consignments especially bred and fed at the Government experimental farm at Cedara, Natal, were pronounced to be of excellent quality and flavor, equal to anything from those two countries.

Several South African firms have made arrangements to devote themselves to meat exporting, chief among them being the Imperial Cold Storage and Supply Co., a strong company with an annual turnover of more than $7,000,000 and with offices in all the important cities of South Africa. In 1915 this firm sent 635 tons of meat, which formed the bulk of the exports during that year. The Farmers' Cooperative Meat Industries (Ltd.), a subsidiary concern of the progressive Natal Agricultural Cooperative Union (Ltd.). of Pietermaritzburg, was recently launched with a capital of $100,000, to engage chiefly in the meat-export business. This concern intends to utilize all the by-products connected with the slaughtering industry, and also to undertake, on a larger scale, the importation of pedigreed stock. Various shipments to England have been made by this company with very satisfactory results. A number of companies have also been formed in the past few months to undertake the ranching business on a big scale. The Swaziland Ranching and Development Co. (Ltd.) intends to stock fully 145,000 acres of land that it has in Swaziland, where 30,000 head of cattle will be pastured in the near future. The Anglo-Swazi Co. also controls large areas in Swaziland, which it plans to stock shortly.

It must be noted, however, that under the conditions prevailing in South Africa the beef supply will not be obtained from large ranches to any considerable extent but, for the most part, will be produced on farms carrying a few hundred head. It is also to be remembered that, like other countries, the Union possesses certain areas well suited for the raising of young cattle, and that other districts where suitable crops are grown are better adapted for fattening purposes. The effective utilization of resources will remedy a deplorable condition, since in the past more than 75 per cent of the cattle were slaughtered before they were properly fattened. By bringing the stock into proper condition, the supply of meat from the same number of animals can be easily increased 10 to 20 per cent.

SHEEP AND WOOL.

South Africa has no clearly defined areas for sheep farming, but in almost every district of the Union there are farms suitable for that purpose. Generally speaking, the country is well adapted for sheep breeding, with vast areas where merino sheep, the type chiefly reared in South Africa, do exceedingly well. The breeding of cross-bred sheep is strongly advocated on account of the demand for wool

of that kind and the fact that cross-bred sheep produce mutton more suitable for export than that of merino sheep. Considering the present importance of this industry, the statement recently made by one of the Union Government's sheep and wool experts that "some of the best sheep country in the Union is to be found in those districts where the flocks are as yet but few" is extremely encouraging. A great proportion of the lands devoted to sheep raising are rather bush growth than grass, and it is remarkable how drought-resisting the prevailing small bush has shown itself in the absence of a normal rainfall. There are few places in the Cape Province, however, where a sheep can support life on less than 2 to 2½ acres of land, and in some parts of the Karroo this is increased to 3, 5, and even 12 acres. Better provision of water and a supply of winter feed are essential requirements for the healthy progress of this industry, since, because of the improvidence of the farmers along these lines, there has been a considerable mortality of sheep in recent years. It is estimated that in 1915, in the Cape Province alone, 2,500,000 sheep died as a result of drought.

A more regular food supply is also indispensable if South Africa is to embark upon the mutton export trade. At the present time the sheep industry is most flourishing in the eastern districts of Cape Province, where merino sheep preponderate greatly. The northwestern part of Cape Province also has large flocks of sheep, but they consist mostly of Africanda and bastard sheep, instead of merino. The Orange Free State has a much greater number of sheep in proportion to its area than any other Province of South Africa. Generally speaking, the sheep areas may be defined as situated in the eastern uplands of the Union, and chiefly in the northeastern part of Cape Province, where high-class sheep are mostly in evidence. In the western districts large flocks are to be seen, but common sheep are more often reared.

It has been proved that sheeep are more liable to attack by scab in the lower altitudes of the Union, where the Boer farmers have hitherto trekked their flocks during the winter. The loss occasioned by scab to South African sheep farmers has been estimated at from $1,500,000 to $5,000,000 per annum in wool alone, and the sheepskins would fetch much higher prices if the animals were free from disease. Stringent regulations for the eradication of scab have been in force throughout the country. An outbreak of disease must be reported to the sheep inspector and to all adjoining owners of land within seven days, and a certain amount of time is given for the cleansing of the sheep. Failure to do this makes the farmer liable to a fine not exceeding $250.

The census of 1911 gives the following numbers of sheep in the various Provinces of the Union:

Provinces.	Wooled.	Other.	Total.
Cape Province	11,051,836	6,082,677	17,134,513
Natal	1,105,023	414,235	1,519,258
Orange Free State	7,355,638	1,232,586	8,587,638
Transvaal	2,330,304	1,084,946	3,415,250
Total	21,842,801	8,814,444	30,656,659

The percentage of sheep owned by the races of South Africa is as follows: Wooled—Europeans, 88.94; others, 11.06. Other than wooled—Europeans, 84.08; others, 15.92.

In 1904 there were 16,322,503 sheep in the Union, showing that in 1911 an increase had been attained of 87.82 per cent. In 1911 there were 5.13 sheep per head of population, and the number of sheep per square mile in the various Provinces was as follows: Cape Province, 61.86; Natal, 43.05; Orange Free State, 170.43; Transvaal, 30.93. Only Cape and Orange Free State Provinces had districts with more than 250 sheep per square mile. These were as follows: Cape Province—Albert, Aliwal North, Barkly East, Cathcart, Molteno, Queenstown, Stockenstroom, Stutterheim, Wodehouse, Idutizwa, Nqamaqwe. Orange Free State—Bethulie, Rouxville, Smithfield, Wepener. The district of Barkly East, with a total of 47,230, led all the districts of the Union in the number of sheep per square mile.

The mortality of sheep in 1911 is given as 3,759,057, as follows: Heartwater, 216,601; malarial catarrhal fever, 37,442; geilzieate, 499,736; worms, 717,132; other causes, 2,288,146; total, 3,759,057.

In recent years there has been a notable increase in the number of wooled sheep, with a corresponding decrease in the nonwooled type. The imports of fresh mutton, which amounted to $607,554 in 1908, decreased to $1,158 in 1915, and a small beginning has already been made in the exportation of mutton.

Wool ranks first among South African exports of agricultural or pastoral produce. The exports of wool rose from 63,473,924 pounds in 1905 to 170,009,886 pounds in 1915, an increase of nearly 170 per cent in 10 years. It may be added that since 1905 good progress has been made in the local manufacture of woolen blankets; this industry now consumes a fair amount of South African wool, so the increased production of wool during the 10-year period mentioned was not improbably about 200 per cent. The value of the wool exported in 1915 was $26,182,407 and that of the sheepskins $4,027,467.

OSTRICHES AND OSTRICH FEATHERS.

For the last three years ostrich farming and the feather industry have been suffering from an acute depression, following almost immediately a period of great prosperity. This depression was undoubtedly brought about by the enormous and increasing production of feathers in the country and the vagaries of fashion. It has been suggested that the introduction of the antiplumage bill in the British Parliament in 1913 created a disturbing element, and the subsequent outbreak of war, with the restricted demand for all articles of luxury, brought about the present collapse of the feather industry. Excessive speculation in lands suitable for the rearing of ostriches and the enormous prices paid for good breeding birds are perhaps as largely responsible for the losses suffered by a large number of farmers as the dislocation of the feather market itself.

A big and unexpected movement in feathers took place in 1915, as shown by the following statistics, which give the quantity of feathers exported in recent years, the total value, and the average price obtained per pound:

Years.	Pounds.	Value.	Price per pound.
1912	999,704	$12,739,803	$12.74
1913	1,023,307	14,373,631	14.04
1914	755,325	6,534,332	8.65
1915	948,945	3,619,566	3.81

From January 1 to June 30, 1916, 274,882 pounds of feathers, valued at $1,546,243, at an average price of $5.62 per pound, were exported. The figures for the corresponding period of the previous year were 551,213 pounds, valued at $1,972,203, or $3.57 per pound. This shows that in 1916 the quantity exported decreased to one-half; the value per pound, however, was 57 per cent greater. The prices obtained during 1915 were the lowest since the industry began, but a marked recovery is noted for the first six months of 1916. The low prices affected every farmer and particularly those specializing in breeding birds, since the sale of chicks and breeding and feather birds practically ceased. The farmers who had taken up ostrich raising during recent years and who paid the fancy prices prevailing when the industry was prosperous, were, in most cases, unable to withstand the depression, and a great number of them were thrown into insolvency. Those situated in the districts not well adapted for the ostrich gave up their birds entirely and confined themselves to their more legitimate callings. It is not likely, however, that a single bona fide ostrich farmer has wholly given up his birds, because of the belief that good times will return with settled economic conditions. When the feather slump first came efforts were made by ostrich farmers to develop other branches of agriculture, such as sheep, cattle, and fruit; some relief was afforded by the large purchases of alfalfa by the military, which are reflected in the increased importations of hay presses and other hay tools during 1915 and 1916. Unfortunately, the drought recently experienced in South Africa affected severely and particularly those districts in which the ostrich industry was most widely prosecuted, so that the combination of low prices for feathers and the severe drought will make the total recovery of the ostrich farmers rather slow.

The present position of the feather industry and its future prospects must be studied in the closest relation to the war, and one of the sources of satisfaction is that feathers are now moving instead of unduly accumulating to retard future operations. Every feather produced can be marketed if the farmer is willing to accept the price offered, and the fact that in these disturbed times all feathers can be sold is highly significant of a bigger demand when the war is over.

By the time settled conditions return the reduction in the number of birds will have proceeded very far, and as the demand increases a scarcity of feathers will be experienced, which will result in enhancing prices. The reduction in the number of ostriches in the Oudtshoorn district, the chief ostrich-farming district of South Africa, during the 12 months preceding the preparation of this report has been estimated by two prominent buyers at 50 per cent; two others give the percentage as between 50 and 60 per cent; while others compute it as high as between 65 and 70 per cent. It is very generally agreed

that, on the whole, the number of ostriches has decreased about one-half since 1913. This reduction, fortunately, is mainly among the inferior birds, for all farmers are retaining their superior feather birds and breeders as a nucleus from which to increase their birds once the revival sets in.

UNFAVORABLE CONDITIONS AND WASTEFUL METHODS.

One of the undesirable features in connection with ostrich farming has been that many farmers have hitherto invested their all—both capital and activities—in that one industry, so that their prosperity is entirely regulated by the state of the feather market. The industry enjoyed such favorable times a few years ago that many farmers became overconfident to the extent of speculating a great deal on the future of the enterprise. The long drought and the restricted demand have caused, therefore, most appalling losses, and in a great many cases farmers have been forced into bankruptcy. These unfavorable conditions have undoubtedly exercised a sobering influence among the farmers interested, by emphasizing the advisability of adding other agricultural pursuits to that of ostrich raising, instead of specializing in that industry to the exclusion of all other branches of farming. Fruit and tobacco growing, the production of fodders, and dairying can be undertaken on nearly all farms where ostriches are kept, and much has already been accomplished in this direction in the chief ostrich districts.

It is also admitted that, on account of the prosperity enjoyed by the ostrich industry in the past, extremely wasteful methods were followed. The general practice of allowing ostriches to pick their food from the alfalfa plants is said to impair greatly the vitality of the alfalfa fields because of the constant treading of the ostriches upon the plants. As is well known, anything treading on the crowns of the alfalfa plants on frosty mornings bruises them, and the subsequent action of the sun results in burning them out. Experienced ostrich farmers believe that the most economical method is to cut the alfalfa and feed it to the birds, whereby an acre of alfalfa will support double the number that it otherwise would. This method is still but little followed, but it will assuredly become more common in the future. Its general adoption would tend to stimulate greatly the demand for all kinds of hay-handling tools and machinery throughout the ostrich sections of the Union.

DEVELOPMENT OF THE INDUSTRY.

The great boom in ostriches began in 1880, when people of all sorts left their employment to participate in an undertaking that was thought to hold the certainty of a large fortune within a few years. One thousand dollars for a pair of birds was a common price, and particularly fine birds sold sometimes for $5,000. Since 1882 ostriches have been bred from carefully selected strains, and first-class birds brought, until recent years, as much as $2,500 each for breeding purposes. In 1911 there were 728,087 ostriches in Cape Province, 4,111 in Natal, 9,097 in Orange Free State, and 5,441 in Transvaal. The districts having 15 ostriches per square mile were all in Cape Province, led by Oudtshoorn with 66.9 ostriches per square mile and

a total number of 110,578. Following in importance were Bathurst, Robertson, Albany, Alexandria, Ladismith, Peddie, Steytlerville, and Uitenhage. In 1904 there were 360,830 ostriches in South Africa, there having been, therefore, an increase of more than 105 per cent in 1911. It is more than likely that the number of ostriches at the end of 1914 was nearly double that in 1911, but, as already indicated, there has been a great reduction since that year.

CIRCUMSTANCES DETERMINING PRODUCTION AND PROFITS.

A good ostrich will yield feathers of as much as five times the value of a common bird, whose selling price may be $15 or $20. An exceptionally good bird should yield from 25 to 32 ounces of feathers and should give from 60 to 62 long whites and blacks and 60 to 70 long blacks, in addition to the smaller body feathers. Birds fed on alfalfa can sometimes be plucked three times in two years, but once a year is a fair average, or twice in three years where food is less plentiful. The cock yields about twice as many feathers as the hen. A pair of birds breeds as often as three times in a year and can hatch some 16 or 17 eggs at a sitting.

The ostrich does well from Calvinia on the west to beyond Cradock on the east, and from far beyond the confines of Cape Province on the north down to the coast on the south. The birds are most numerous around Robertson, Montagu, Oudtshoorn, and Ladismith. When fully grown they are allowed to run in camps of 1,000 or more acres in extent, but where land can be perennially irrigated and alfalfa grown ostriches may also be kept permanently in inclosed spaces. In some cases, under these conditions, four or five birds can be fed on an acre.

Before the slump, ostrich feathers figured second in the export list of South African agricultural and pastoral products, and ostrich farming has led to the extensive cultivation of alfalfa under irrigation and has given an impetus to fencing. By a process of careful selection feathers have been produced for which as much as $500 has been paid for a pound weight. Under favorable conditions and with a steady market the ostrich industry constitutes one of the most remunerative branches of farming, especially when it includes the sale of chicks and breeders. During the few years preceding the depreciation of the feather market, the price of irrigated land rose from $125 to $500 per acre—amounts quite warranted on the returns from birds, but wholly unjustified on any other basis.

GOATS AND MOHAIR.

The common Cape goat is an improvement on the original breed, but it is of little value. It can thrive, however, where no other animal can get a living, and is indispensable in many parts of the country where it forms one of the principal articles of food. The Angora goat is the result of a cross between the ordinary Boer goat ewe and high-class Angora rams introduced at great expense many years ago from Kashmir and Asia Minor.

Statistics show that the average of mohair per annum on each Angora goat is about 2½ pounds. Exports of mohair started in 1857 with $50 worth. They reached high-water mark in 1912, when 23,-

479,727 pounds of mohair were exported, valued at $4,707,297. In 1915, 16,304,378 pounds were exported, valued at $3,346,376. The value of the goatskins exported in 1915 was $1,289,014. The prices of mohair had been steadily increasing up to the outbreak of the war. In 1908 $0.18 per pound was paid, whereas in 1913 $0.23 was the price received. In 1915 the price averaged about $0.20 per pound. The number of goats in the Union of South Africa in 1911 was as follows:

Provinces.	Angora.	Others.	Total.
Cape Province	3,340,132	4,613,282	7,953,414
Natal	127,452	861,822	989,274
Orange Free State	545,577	502,994	1,048,571
Transvaal	262,174	1,509,546	1,771,720
Total	4,275,335	7,487,644	11,762,979

The percentage owned by the several races was: Angora—Europeans, 89.10; others, 10.90. Other than Angora—Europeans, 44.22; others, 55.78.

In 1911 there were the following number of goats per square mile: Cape, 28.71; Natal, 28.03; Orange Free State, 20.81; Transvaal, 16.04. The following districts had more than 100 goats per square mile: Aberdeen, Bedford, Cradock, Glen Grey, Herschel, Jasenville, Somerset East, Steytlerville, St. Marks, and Tsomo. The greatest density was in the district of Jasenville, which had 200.51 goats per square mile. In 1911 a total of 1,112,687 goats died—65,605 of heartwater, 31,811 of Nanta, and 1,012,271 from other causes. Goats increased 20.39 per cent between the years 1904 and 1911.

Thanks to the efforts of breeders, the South African pure-breed Angora goat is truer to type than is its Asia Minor progenitor. It yields a fleece that is heavier and longer than the Turkish, equal in luster, and free from kemp. South Africa now exports annually about double the quantity of mohair that is shipped out of the Turkish Empire.

HORSES, MULES, AND ASSES.

It is estimated that five-sixths of South Africa is uninhabitable for horses, but, while the horses seen in the country are small in size, ugly, and underbred, they have proved to possess great powers of endurance and to be capable of standing many years of hard work. In recent years sires of the thoroughbred, hackney, Cleveland, and Suffolk Punch types have been introduced, with the object of improving the make and shape and adding to size and bone. Horse sickness is at times a terrific plague, and since it first appeared it has never been stamped out. Outbreaks seem to occur at intervals of from 10 to 15 years. If horses were not bred in a haphazard fashion, and proper shed accommodations were provided, the ravages of horse sickness would doubtless be greatly mitigated. Some parts of South Africa—especially around Kimberley and Vryburg—are said to be unrivaled for the breeding of horses.

The best mules of South Africa are bred by Spanish jackasses out of Cape mares, and the general run compare favorably with those to

be seen in the best breeding countries of the world. Mules are less affected by sickness than horses, live longer, and are generally more hardy and better able to stand the rough treatment to which all animals in South Africa are subject.

Asses are often used in the southwestern districts of Cape Province for agricultural work, although they are small and of scant weight. Eight are used to pull a 6-foot binder. These animals do not suffer from horse sickness, and they are bred in the eastern sections of Bechuanaland and in Rhodesia. They prove most hardy for transport purposes and are thus employed in those sections where contagious diseases among the cattle prevent these from doing such work.

The number of horses, mules, and asses in South Africa, according to the 1911 census, was as follows:

Provinces.	Total horses.	Horses, stud stallion.	Brood mares.	Other horses and mares.	Mules.	Asses.
Cape Province	333,962	15,217	95,228	223,517	47,059	191,086
Natal	75,567	2,207	18,647	54,713	15,602	28,018
Orange Free State	220,725	7,027	83,109	130,589	5,995	11,558
Transvaal	89,160	3,840	21,638	63,682	25,275	106,048
Total	719,414	28,291	218,622	472,501	93,931	336,710

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IV. MARKET FOR PARTICULAR LINES OF EQUIPMENT.

The following table shows the number of agricultural machines in each Province of the Union of South Africa when the census of May 7, 1911, was taken:

Implements and machinery.	Total.	Cape Province.	Natal.	Orange Free State.	Transvaal.
Balers, chaff	1,111	341	158	243	369
Binders	3,829	3,156	19	382	272
Butter workers	4,487	2,380	486	866	755
Carts	66,457	36,462	3,855	12,833	13,307
Churns	33,804	16,117	1,845	8,824	7,018
Cleaners and shellers, corn	14,522	6,285	2,909	2,751	2,577
Crushers, corn	1,117	10	845	103	159
Cultivators	28,086	8,621	7,228	5,391	6,846
Cutters:					
Hay and straw	9,070	6,028	1,116	1,142	784
Root	1,450	907	294	152	97
Drills[1]	7,850	1,763	1,678	2,122	2,287
Engines:					
Gas	241	154	37	29	21
Oil	980	513	109	168	190
Steam	1,331	599	214	231	287
Harrows	68,125	28,755	7,185	14,009	18,176
Incubators:					
Ostrich	1,620	1,495	41	29	55
Poultry	2,539	913	485	580	561
Mills, wind	2,381	1,227	94	914	146
Mowers	12,597	7,695	1,559	1,527	1,816
Plows:[2]					
One-furrow	211,927	116,202	35,299	19,236	41,190
Two-furrow	70,259	22,221	4,248	22,442	21,348
Three-furrow	7,428	2,981	1,107	1,278	2,062
Four-furrow	178	57	51	12	58
Presses:					
Hay	3,558	1,585	493	624	856
Wine	970	909	11	44	6
Wool	1,395	1,044	58	262	31
Pumps, wine	1,020	959	5	45	11
Rakes	6,661	2,165	1,320	1,400	1,776
Reapers	4,659	2,743	281	876	759
Scrapers, dam	15,184	8,575	406	1,742	4,461
Separators, cream	18,619	7,667	1,740	6,490	2,722
Stackers	236	109	15	62	50
Strippers, corn	490	254	60	106	70
Thrashers	1,503	697	272	247	287
Wagons	76,407	34,685	5,630	22,482	13,610
Winnowers	2,132	1,110	708	184	130

[1] Includes grain drills and corn drills and planters. Grain drills, even now, are not extensively used in South Africa. It is doubtful whether there are 250 grain drills in the country at this time.
[2] Includes all types of plows, both disk and moldboard.

According to the official customs returns, the value of agricultural implements and machinery imported by the Union of South Africa during the three years preceding the war fluctuated between $3,000,000 and $3,500,000 per annum. Owing to the manner in which the customs returns are compiled, these figures do not include windmills, hay presses, pumps, binding twine, and several other lines, nor the agricultural machinery and implements imported by and for use in Rhodesia and Portuguese East Africa. It is safe to state that the aggregate value of the imports of all classes of agricultural machinery and implements into South Africa in normal years is not far below $5,000,000.

These figures speak rather favorably of the present importance of South Africa and of the hopeful outlook offered by the country

as a market for the sale of farm machinery, especially when it is considered that 20 years ago the people were chiefly engaged in mineral and pastoral pursuits and that until recent years large areas were inhabited almost solely by black natives. The present position, when these facts are considered, can not be regarded as otherwise than satisfactory and justifying the continued effort and interest of American manufacturers.

Figures given elsewhere indicate that the United States sells more farm machinery to South Africa than any other country. It supplies from 45 to 50 per cent of the Union's requirements. American goods have been a factor of importance in that trade since the very early days. When farm machinery began to attract the attention of South African farmers, various American firms spent a great deal of money and displayed much enterprise in adapting their goods for that country. They sent their salesmen and experts there, who frequently covered the country in ox wagons with the object of demonstrating their machines in actual operation. This often involved considerable personal hardship and inconvenience to these men. They were as pioneers opening up a new land. To their ability and energy the manufacturers who have entered the market in recent years owe much, since their efforts broke down the prejudices of the conservative Boer farmer against the use of modern machines for his farm work. It must be admitted that the hopes of the firms who took an interest in South African trade in the early days of the country's agricultural development have not been fulfilled in all cases. In various instances they seemed justified in expecting a more rapid and progressive development of the agricultural resources of South Africa, and as a consequence, a greater demand for farm machinery. Unfortunately, a series of severe droughts have retarded progress and arrested the vigorous activity with which many farmers set themselves to the task of placing South Africa among the large primary producing countries of the world. This induced some of the concerns to withdraw, either partly or wholly, from active operations there in recent years. They have contented themselves with such business as their agents could secure unaided. The outbreak of the war counteracted in part the damage to their trade that otherwise would have followed the adoption of such a policy. There is every justification to recommend that these manufacturers continue their efforts. The time can not now be far distant when an increased demand will compensate for their past disappointments. The two or three years following the conclusion of the war, at any rate, should determine the degree of expansion of which South Africa is capable along agricultural lines, and our manufacturers would do well to maintain the prestige and ascendancy that they enjoy at present until something more definite is known of South Africa's potentialities as a market for the sale of agricultural machinery.

In regard to developments in the near future it may be opportune to remark that though South African importers have been rather conservative in their ordering since the war began, a short time ago they began placing orders more freely. There is much reason to believe that at the termination of the war many orders of importance will be placed. On the whole, farmers have purchased sparingly since the war began. Many of them will assuredly renew their working equipment after peace is restored. In addition, large numbers

of retired soldiers, it is hoped, will be settled on the land. That there should then be a period of great activity in the sale of farm machinery seems unquestionable. Our manufacturers, from all indications, will be justified in making adequate efforts to secure the orders that will be placed as a consequence of these conditions.

PRESENT USE AND DEMAND.

Gang plows, corn planters, lever harrows, one-horse corn cultivators, mowers, rakes, and corn shellers are already to be seen on almost every farm. The virgin fields remaining to be exploited, as regards the introduction of these machines, are very limited. Much scope exists, however, for the sale of the more improved types of implements, such as two-row planters, arch cultivators, grain drills, disk harrows, gas engines, ensilage cutters, and various other machines. While most farmers inclined to keep abreast with the times (especially those residing in closely settled districts) are rapidly beginning to use these machines, there still remain vast numbers who have not yet shown an inclination to do so. There is a substantial field for development in many districts for the lines indicated, and this fact should at least serve to keep up the normal demand for implements, when conditions become settled. As has been indicated elsewhere, the care given to farm machinery and implements in South Africa leaves much to be desired, and the few years of service obtained from them is utterly out of proportion to what might reasonably be expected. It will probably be a long time before this important matter of farm management is properly understood. In the meantime this carelessness will have to be made good through the purchase of new machines. This constitutes a feature of no small importance in a consideration of the future demand.

STATISTICS OF IMPORTS.

The total imports into the Union of South Africa of farm machinery and implements and related lines during the years 1913, 1914, and 1915 are shown in the table below. In respect to these statistics it must be noted that it has not been possible to ascertain what machines are included under the headings of "implements" and "machinery."

Articles.	1913	1914	1915
Agricultural implements:			
Dairy utensils	$228,862	$105,788	$144,019
Hoes and picks	44,363	30,528	19,446
All other, not otherwise specified	1,705,845	1,637,631	1,101,454
Agricultural machinery	1,018,130	491,769	366,681
Binding twine	92,964	109,287	83,392
Carriages and carts, and parts thereof [1]	203,931	134,101	86,079
Engines, traction	84,313	26,999	24,644
Fencing wire	1,555,080	1,042,808	395,977
Mills, wind	388,205	334,625	168,376
Presses, wool and hay	33,734	44,226	55,138
Pumps [2]	563,837	587,601	432,140
Total	5,919,264	4,545,363	2,877,346

[1] The classification "Carriages and carts, and parts thereof" is, in the main, composed of parts for vehicles. It is very rarely that one sees at present any carriages and carts in South Africa that are not the product of local factories. All fittings, castings, steels, and other parts, however, are imported, and these are included under this heading.

[2] Pumps for farm water supplies and irrigation, as well as those used in the mines, are included under the heading of "Pumps." At least 75 per cent of the value represents that of mining pumps. Pumps used for agricultural purposes are chiefly supplied by American manufacturers.

The imports of farm machinery and implements and related lines into the Union of South Africa, by classes and countries of origin during the years 1913, 1914, and 1915, are as follows:

Countries and articles.	1913	1914	1915
UNITED STATES.			
Agricultural implements:			
Dairy utensils	$9,724	$6,166	$7,617
Hoes and picks	467	297	165
All other not otherwise specified	804,934	786,013	501,892
Agricultural machinery	382,911	185,277	219,752
Binding twine	26,342	18,629	47,322
Carriages and carts, and parts thereof	130,690	95,636	68,321
Engines, traction	27,970	3,202	2,793
Fencing wire	721,156	456,925	302,706
Mills, wind	296,365	277,667	142,068
Presses, wool and hay	23,062	29,106	44,300
Pumps	150,316	140,564	126,159
Total	2,573,937	1,999,482	1,463,095
UNITED KINGDOM.[1]			
Agricultural implements:			
Dairy utensils	20,488	13,281	11,110
Hoes and picks	42,319	29,433	19,281
All other not otherwise specified	665,202	515,547	445,440
Agricultural machinery	386,867	185,287	121,847
Binding twine	6,570	3,246	3,431
Carriages and carts, and parts thereof	44,051	25,535	6,064
Engines, traction	56,294	23,544	21,851
Fencing wire	393,739	278,607	82,965
Mills, wind	89,831	53,507	24,882
Presses, wool and hay	9,845	13,923	10,366
Pumps	331,540	323,155	234,468
Total	2,046,746	1,465,065	981,705
GERMANY.[2]			
Agricultural implements:			
Dairy utensils	36,435	11,091	384
Hoes and picks	1,577	788	.....
All other not otherwise specified	138,029	120,981	10,896
Agricultural machinery	29,247	22,945	.....
Carriages and carts, and parts thereof	1,056	1,075	.....
Fencing wire	405,953	294,900	9,095
Pumps	63,313	107,808	1,611
Mills, wind	277	1,543	.....
Presses, wool and hay	.....	769	.....
Total	675,887	561,900	21,986
CANADA.[3]			
Agricultural implements:			
Dairy utensils	1,917	2,190	876
All other not otherwise specified	66,710	199,108	116,227
Agricultural machinery	203,502	92,410	21,500
Binding twine	59,965	86,891	32,518
Carriages and carts, and parts thereof	22,084	7,777	3,587
Fencing wire	3,368	560	326
Mills, wind	.....	.....	1,426
Pumps	.....	1,767	.....
Total	357,546	390,703	176,460
SWEDEN.[4]			
Agricultural implements:			
Dairy utensils	120,782	46,528	100,260
All other not otherwise specified	4,399	3,276	6,263
Agricultural machinery	764	589	735
Pumps	2,224	258	.....
Total	128,169	50,651	107,258

[1] The imports from the United Kingdom are very general in character. In a number of items manufacturers of that country have a greater share of the trade than American manufacturers; among these are disk plows, disk harrows, large thrashing and shelling outfits, and chaff cutters.

[2] Imports from Germany, other than dairy utensils, hoes, and picks, are, in the main, two and three furrow plows.

[3] The imports from Canada are for lines like those supplied by American firms. It is quite possible that Canada's shipments of two and three furrow moldboard plows are nearly as large as those made by all American manufacturers combined. It is generally conceded that the most popular moldboard gang plow in South Africa is the product of a Canadian factory.

[4] Sweden has most of the cream-separator trade.

Countries and articles.	1913.	1914.	1915.
BELGIUM.[1]			
Agricultural implements:			
Dairy utensils	$22,254	$10,458	$7,806
All other not otherwise specified	638	175	.....
Agricultural machinery	6,030	214	.....
Carriages and carts, and parts thereof	1,986	156	.....
Fencing wire	30,790	11,792	793
Pumps	2,521	341	.....
Total	64,219	23,136	8,599
AUSTRALIA.[2]			
Agricultural implements:			
Dairy utensils	3,173	2,419	1,265
All other not otherwise specified	22,717	11,266	19,651
Agricultural machinery	8,166	4,336	1,508
Carriages and carts, and parts thereof	3,304	3,752	7,923
Mills, wind	1,713	1,445	.....
Pumps	2,365	1,976	1,129
Total	41,438	25,194	31,476
DENMARK.			
Agricultural implements:			
Dairy utensils	10,565	10,726	13,539
SWITZERLAND.			
Pumps	7,660	8,632	64,306
FRANCE.[3]			
Agricultural implements:			
All other not otherwise specified	1,445	949	832
Agricultural machinery	.....	.....	540
Pumps	1,820	2,253	2,823
Total	3,265	3,202	4,195
NORWAY.			
Agricultural implements:			
Dairy utensils	1,085	662	638
Pumps	2,029	847	1,586
Total	3,114	1,509	2,224
NEW ZEALAND.			
Agricultural implements:			
Dairy utensils	1,436	1,251	136
All other not otherwise specified	1,085	311	.....
Total	2,521	1,562	136
NETHERLANDS.			
Dairy utensils	954	735	184
AUSTRIA-HUNGARY.			
Agricultural machinery	10	662	.....
BRITISH INDIA.			
Binding twine	.....	506	121
ALL OTHER COUNTRIES.			
Agricultural implements:			
Dairy utensils	49	281	63
Hoes and picks	.....	10	141
All other not otherwise specified	686	5	253
Agricultural machinery	633	49	799
Binding twine	87	15	.....
Carriages and carts, and parts thereof	760	170	184
Engines, traction	49	253	.....
Fencing wire	74	24	92
Mills, wind	19	463	.....
Presses, wool and hay	827	428	472
Pumps	49	.....	58
Total	3,233	1,698	2,062

[1] Belgium ships cream separators, a certain machine made in that country enjoying great favor.
[2] Australia's only exports to South Africa are disk plows and stripper harvesters.
[3] Shipments from France consist of viticultural machinery.

PRICES.

The prices given in this report, unless otherwise indicated, are the net retail prices prevailing in South Africa before the outbreak of the war and as quoted to farmers by coast importers f. o. b. cars at port of arrival. Discounts varying from 10 to 20 per cent for invoices due in 90 days, and an additional discount of 5 per cent for cash paid in 30 days, are, however, given to country dealers by importers. In the interior centers, such as Johannesburg and Bloemfontein, the retail prices are from 10 to 15 per cent higher, and in Rhodesia from 25 to 33⅓ per cent higher.

Before the war the approximate cost of importing farm machinery from England, Canada, and the United States, with all charges included, ranged from about 15 per cent of the manufacturers' prices for plows, harrows, mowers, and similar machines that pack compactly to 25 and up to 40 per cent for shellers, ensilage cutters, steam engines, binders, drills, thrashers, and other bulky machines.

There is no fixed understanding between South African importers as to how to figure the retail prices of farm machinery on the basis of cost of importation. Generally speaking, however, the net retail prices of plows are usually 75 per cent higher than the net manufacturer's price f. o. b. at port of embarkation. Binders, mowers, planters, and rakes are 100 per cent higher, and disk plows, disk harrows, cultivators, and gas engines about 125 per cent higher. Steam engines, tractors, and other large machines are retailed at prices usually 75 per cent higher than the manufacturer's f. o. b. prices.

Considering the expense of importing, together with the discounts given to dealers, and the capital invested in the business by importers of this class of goods, it can not be said that they are making anything like big profits. If the business of most of the importers had been restricted to the sale of farm machinery, it would have been discovered in many cases that they were far from making adequate profits. With few exceptions, farm-machinery importers also sell other classes of machinery, hardware, metal products, and often furniture, automobiles, and general merchandise. This has enabled these firms to become established in the agricultural-machinery trade without having to depend on the sales of that department of their business for a suitable profit to keep them from suffering financial embarrassment. The idea has always been that the time would surely come when the development of the country's agricultural resources, bringing in its wake a greater demand for farm machinery, would repay these firms for the meager profits made in the early days of the business.

As a rule the prices quoted by American firms have been found satisfactory. As a matter of fact many South African importers would readily pay somewhat higher prices if the material and finish of the goods were improved to an extent commensurate with such an increase in price. Prices quoted by plow manufacturers when first introducing their goods have in several cases proved an exception to this rule, and the excessive prices they ask for their plows have often proved an obstacle. This has occurred when prices have been based on the cost of production of a small number of machines. It is obvious that when this has been the case the importer has been

placed at a great disadvantage, since he has been compelled to ask a higher price for an unknown machine than that asked by his competitors for machines long and favorably known in the market. It will be necessary for any manufacturer who is desirous of entering the South African plow trade to forego much, if not all, of the profit that he would make in the normal course of business in order to introduce his plows in small quantities in that market. The manufacturer should have sufficient confidence in the ability of his agent and in the quality and adaptability of his plows to be willing to wait for the time when a large demand for them is established to compensate him for the small profits made during the original period of introduction.

TYPES OF IMPLEMENTS USED.

In reviewing the various machines used in South Africa the types considered most popular and best adapted are described. It is evident that on the whole the machines required must embody material of first quality, simplicity of design, and strong construction. With the exception of gang plows, both disks and moldboards, and maize planters, no definite standards were adopted until recently. The policy appears to have been to meet the varying ideas of the farmers and to furnish them what they wanted, with the result that many different machines were offered in the past. This condition has now been largely done away with. The tendency at present is to concentrate all efforts on the sale of the farm machines that have heretofore proved most successful, and these, on the whole, are very similar in character to those extensively used in the United States.

PLOWS.

Aside from the natural economic disadvantages in offering his wares, the small manufacturer has nearly as good an opportunity to do business in South Africa as the large manufacturer. With few exceptions South African importers do not concentrate their buying with any one firm, but purchase wherever they believe they can do so most advantageously. On the other hand, the probability of a business remaining small and stationary for many years or expanding rapidly in a short time often depends upon whether a line of farm machinery contains some of the leading tools used in South Africa. Since the leading farm machine in South Africa is the gang plow, it is obvious that a great advantage will be enjoyed by the manufacturer who is able to offer a line that includes an assortment of plows to cope with the varying demand and requirements of the different sections of South Africa. Several cases have come under observation wherein the unwillingness of the manufacturer to take up seriously the production of a suitable line of plows for that country has made almost unavailing the intense efforts put forth by him to create a demand for his other goods. It is especially recommended that manufacturers of a full line of machines for the cultivation of corn take these remarks into account, as their otherwise excellent chances to sell planters, cultivators, etc., are likely to be handicapped if their plows are not to the liking of the South African trade.

Plows are the only important exception to the rule that the farm machinery suitable for conditions in the United States is satisfactory, with minor changes, for the trade of the Union. A great variety of plows are seen in South Africa. In recent years, however, except in the southwestern districts, the plow trade has become fairly well standardized. The two-furrow walking moldboard plow is the type most widely used. Disk plows, on the other hand, are very popular in some parts of the country, chiefly in Rhodesia, where they are in greater demand than moldboard plows.

Strength and simplicity of construction are the principal features to consider. American plows make a strong appeal in many respects, but on the whole the trade does not think that they are satisfactory in every way. Axles, beams, frames, bottoms, and other important parts are strong enough, but the complaint is often made that not enough care is exercised as regards the strength of some of the less important parts. Breakages therefore occur, and this has served to create the belief that, while American plows have some most excellent features, they are not as strong as is desirable for the severe soil conditions often encountered in South Africa. An improvement in this respect has been observed in recent years, but it can not be too strongly emphasized that American manufacturers should never risk putting on their plows (or, for that matter, on other machines for South Africa) parts or castings regarding which there is any doubt as to whether they will stand the rough treatment and abuse that they will receive in the hands of the natives.

The possibilities for the introduction of new lines of American plows in South Africa are not altogether encouraging. The number of firms interested in their importation is relatively small and each has now a more or less satisfactory line of plows for its trade. It is felt, however, that it may still be possible to introduce a few new lines if a satisfactory product is offered. The manufacturers intending to do so, however, must be prepared to display considerable interest and enterprise, for unless they can convince their prospective customers that they are thoroughly in earnest they will be given little encouragement. A large American firm, as a case in point, has built up, in the course of two years, a trade far more important than that of other American firms that have been in the South African trade for many years. The success of this firm is attributed to the fact that it undertook the task in such an aggressive and intelligent manner that it secured the wholehearted support of the intended agents. A competent designer was sent to South Africa with sample plows constructed along the lines considered satisfactory for that country. Exhaustive trials and tests of the plows were carried out, during which many changes and alterations were found necessary and made at once. In due course of time the machines were approved as being all that was desired, and they were then shipped back to the factory to serve as patterns for the manufacture of the plows ordered by the South African agents. The earnestness and energy of the American concern promoted so much confidence that one of the largest orders for plows ever placed by a South African firm was sent to the manufacturer when the samples were shipped back to the factory. The value of this order probably compensated the manufacturer for all the expenses involved in thus adapting the machines to the con-

ditions of the country. Such a method of entering the market could be imitated with every possibility of success. This method certainly appears more practical than to attempt to perfect machines for the foreign trade in the manufacturer's own factory. For one thing, it prevents the loss of time. To test the machines thoroughly under the conditions that they will encounter day after day, making on the spot such changes as may be necessary, so as to ascertain whether they were justified or correctly made, is a plan that deserves the careful consideration of farm-machinery manufacturers interested in foreign trade.

The census of 1911 gives the following number of plows as in use in South Africa at that time:

Provinces.	One-furrow.		Two-furrow.		Three-furrow.		Four-furrow.	Total.
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	
Cape	54,295	71	19,834	26	2,642	3	35	76,796
Bechuanaland	5,280	85	883	14	37	1	.....	6,200
Transkei	56,627	97	1,504	2	302	1	22	58,465
Total	116,202	84	22,221	14	2,981	2	57	141,461
Natal	31,739	86	4,163	11	1,099	3	50	37,051
Zululand	3,560	98	85	2	8	.....	1	3,654
Total	35,299	92	4,248	6	1,107	2	51	40,705
Transvaal	41,190	64	21,348	33	2,062	3	58	64,658
Orange Free State	19,236	45	22,442	52	1,278	3	12	42,968
Grand total	211,927	69	70,259	28	7,428	3	178	289,792

These figures are not of much value to-day, as there has undoubtedly been a gradual improvement in agricultural methods since they were obtained and consequently in the type and size of plows used. It is interesting to note, however, that, excluding the native territories, 36 per cent of the plows were either two, three, or four furrow plows. If the kind of plows used by Europeans could be ascertained it would probably be found that not less than 75 per cent are other than single-furrow plows.

MOLDBOARD WALKING GANG PLOWS, HEAVY TYPE.

Almost without exception these plows are operated by natives. In the existing order of things such labor is far from competent. The work is done with carelessness and indifference, and it is not infrequent for a native to tip a plow over when taking it out of the ground or in turning a corner. This risk is augmented because large and unwieldy teams of oxen are used to operate the plows. It is quite apparent that, unless such parts as levers, quadrants, etc., are sufficiently strong, costly breakages will occur. Ten to sixteen oxen are ordinarily used to pull these plows, and the depth of plowing desired is seldom less than 8 inches. The plow, consequently, is subject to considerable strain, again emphasizing the necessity for great strength. South African farmers, furthermore, often find it necessary to plow when the soil is hard and dry, and under such condi-

tions a plow must be exceedingly strong to withstand the severe strain resulting.

The beams of these plows are made of very heavy steel. They are high arched and extra long, to assist in keeping the plows on the ground when plowing hard soils. This reduces the tendency of the plow to run on its nose. Strong bracing of the beams is very important. Front, center, and rear braces should be provided. One-piece steel forgings are often used for these braces. The rear brace (which in most cases is made of heavy beam stock) is securely kept in place with two or three heavy bolts on each side. This brace must be curved in order to allow as much clearance as possible between the bottoms. It is important that the front end of the beams be strongly braced together and counterbraced.

The two front wheels must be very strong and should be set well forward off the point of the share, when the bottoms are on the ground, so as to let as much as possible of the rear weight of the plow rest or fall on the plow bottoms. This will aid in keeping them on the ground in heavy lands. Such construction also facilitates the proper balancing of the plow when oxen are used. These wheels are about 25 inches in diameter and have fairly broad and heavy rims. The very best construction must be provided, such as wide bearings, sand caps, and dust-proof grease magazine boxes. The furrow wheel is generally staggered—that is, it travels at an angle against the bottom of the furrow wall. This prevents side strain and facilitates making furrows of a uniform width. A suitable swivel rear wheel, for transport purposes, often forms part of the regular equipment of these plows. In some cases this is made of pressed steel and is of a small diameter and very simple construction. A more elaborate rear wheel, capable of up-and-down adjustment, is beginning to be provided, especially for the heavy plows of this type.

The furrow and land wheels are mounted on independent axles but are both operated by a single hand lever that regulates the depth of plowing and raises the plows for turning and for transport. Both of these axles are of high carbon steel, $1\frac{1}{2}$ inches in diameter, and they often extend across to support the beams. The land axle in most cases is long enough to connect with both beams. The most popular plows of this type are so constructed that when the plows are on the ground the axles remain cranked forward. When the lifting lever is released, and by means of the forward movement of the team, assisted by a heavy coil spring, the axles are cranked back and a power lift is thus obtained. The land-wheel axle must be extra long in order to provide a wide carriage to the plow, which will reduce the danger of overturning it when traveling on rough or plowed land. Both axles must be firmly held in position by large forged steel bearings.

The levers are of one-half, and more often of five-eighths, inch steel, and so constructed that they remain low when the bottoms are out of the ground. This is to prevent their being bent or broken should the plow be overturned, which is by no means an uncommon occurrence. They must also be firmly secured in place by substantial braces and supports. There are generally two levers on these plows. The main lever is to put the plows in and out of the ground, and this often has all-steel ratchet plungers. The auxiliary lever is provided for the purpose of leveling the plows. Both levers should pivot

in bearings of large diameter. The ratchets are of stamped steel secured by strong braces and have deep square notches. Proper attention should be given to this feature; otherwise the levers will leave their places and unpleasant breakages and delays will be the result.

A clevis shift, operated from the rear of the plow, must be provided to control the work and enable the operator, by shifting the hitch, to regulate the width of the front furrow without turning the team. This clevis shift is sometimes operated as a lever, and two well-known plows use the handle of that lever to serve also as the guiding handle of the plow. Without such an arrangement it is necessary to equip the plow with either a single or double guiding handle, which is attached to the rear beam. In the past the construction of the clevis shift was both a cumbersome and complicated arrangement. The tendency in recent years has been to make it very simple and so constructed that it can be put on or off without disturbing other parts of the plow. While such an attitude is now rather the exception than the rule, there are one or two firms that consider the clevis shift an extra attachment and make an additional charge for it.

The question of moldboards for different classes of soil has not yet attracted much attention in South Africa. With very few exceptions all plows are supplied with general-purpose moldboards for both turf and stubble plowing. Attempts have been made by importers to induce farmers to buy plows with other moldboards that, in their opinion, would more satisfactorily turn the soil under certain conditions. Owing to the lack of interest shown by farmers, these attempts have been discontinued. They involved the carrying in stock of various types of plows and plow bottoms, the demand for which was both uncertain and slow. It can not be said that the South African farmer is very exacting in having the soil properly turned over and in the moldboards scouring properly or otherwise. His chief concern seems to be to see his land plowed. He also often takes off the rolling coulters, with the result that the furrow walls become badly broken up. The general construction of the plow bottom does not differ in any essential from that of the best types in use in the United States. Hardened soft-center steel moldboards, shares, and landsides are nearly always furnished. The moldboards have an extra piece of hard steel welded to the shin. giving them double strength and thickness where the greatest wear occurs. Slip heels for the rear landsides are usually provided. The frogs or plates are made of heavy forged or pressed steel. Some manufacturers fit crucible steel shares to their plows instead of soft-center steel shares. It is important that an understanding on this point be had between the manufacturer and the importer. Crucible steel shares, however, as well as heavy cast-iron shares, are largely supplied as repairs. Complaints have often been heard that American steel shares are too high in price, and this belief has frequently led farmers to buy other plows, the spare shares for which could be bought more cheaply. It would be a good point if manufacturers were to emphasize in their catalogues the advantages of the high-grade American steel shares over those made of cheaper materials.

The draft rod is connected either with the front or the center brace. The idea is to get the draft from well back and to carry it forward over the wheels, thereby reducing friction and the draft of the implement. This draft rod passes through a guide attached to the

clevis, the latter having ample vertical and lateral adjustments. The clevis must be made of strong materials and securely fitted to the plow in order to withstand the strain and the rough pulling of oxen. Since oxen are nearly always used in operating these plows, it is necessary to build the hitch with a wide range of adjustment toward the furrow side of the plow, inasmuch as oxen have a tendency to pull in that direction, whereas horses are more inclined to pull toward the land side.

Plows of this description are used for very heavy work. The most difficult soils of South Africa are plowed with them, sometimes to a depth of 12 inches, although seldom more than 10 inches and ordinarily only 8 inches deep. They are most widely used in the higher uplands of the Transvaal and in Rhodesia, where they are in evidence almost to the exclusion of all others. They are to be seen frequently, however, throughout South Africa, although plows somewhat lighter in weight, but built along identical lines, are sold in greater numbers than the heavy type just described.

This plow is supplied with 12 and 14 inch bottoms and weighs about 600 pounds. Plows with 12-inch bottoms sell for $72.50 and with 14-inch bottoms for $73.75. The third bottom attachment complete sells for $17.50 and weighs 125 pounds.

EQUIPMENT OF HEAVY GANG PLOWS.

These plows are shipped complete with shifting clevis attachment and 15-inch rolling coulters. No weed hooks, poles, or eveners are required. Rolling coulters will probably be considered as extras before long, since most farmers take them off the plows and use them only when plowing heavy new ground.

When crucible steel shares are fitted to the plows, it is customary to supply an extra set of shares of the same material. There is no precise rule as to supplying extra crucible shares or otherwise when the plows are equipped with soft-center steel shares. In the majority of cases no extra shares are supplied under such circumstances. A feature of the plow trade, to which importers attach great importance, is the interchangeability of shares. Manufacturers furnishing shares interchanging on the various gang and single-furrow plows that they ship to South Africa will find this much appreciated by the trade. South African importers have argued the advantages of this with their dealers, and in many cases it has influenced the latter in deciding what line of plows to handle. Chilled and plain cast-iron shares are sold very largely as extras. In some sections of South Africa shares with loose reversible points are very popular. Plows fitted with such shares will be largely bought solely on this account. Few American manufacturers supply these, but English manufacturers are often prepared to furnish them.

Corn-dropper attachments are sold to some extent, and manufacturers should furnish these when required. Rear wheels form part of the regular equipment in some cases, and in others they are charged for extra. The latter is more often the case.

A third beam and bottom attachment for the 12-inch two-furrow plow is sold in increasing quantities, especially in the uplands of Transvaal Province and in Rhodesia. They are chiefly required in connection with the heavy style of plow. An extension hitch should

be supplied when the two-furrow plow is so constructed that this would be necessary for it to work properly when converted into a three-furrow plow. Provision must also be made to equip this attachment with a guiding handle whenever it should be impossible to use the handle fitted to the rear beam of a two-furrow plow, when it is converted into a three-furrow plow. These plows are packed one in a box, completely knocked down. It is important that the measurement of the boxes be reduced to the utmost, since, on account of the competition, the profits in the sale of plows of this type are very small.

CANADIAN AND BRITISH COMPETITION.

Canadian manufacturers are the most important competitors of American makers; they produce these plows along lines very similar to our own. Much credit is due them for their share in evolving this type of plow, which is the one most widely used in South Africa. They divide with American manufacturers the gratitude of South Africa's farming community for having perfected a plow that makes it possible to put under cultivation the fertile (though sun-baked) soil, with such crude auxiliaries as native oxen and rough natives. If figures were available it would probably be found that one Canadian firm alone sells nearly as many of these plows in South Africa as all American manufacturers combined. The manufacturer referred to has been interested in this trade for many years, has always worked hand in hand with his agents, and has continually shown a keen disposition to keep his line always to the front. Canadian manufacturers appear to have succeeded in a greater degree than American manufacturers in reducing the complaints made on account of parts that have proved to be of inadequate strength.

Two English manufacturers produce excellent plows of this type, but their inability to meet the American and Canadian prices, because of their smaller output and different manufacturing methods, has proved a great handicap to the development of their trade in this line. In some districts, however (especially in the higher uplands, where the most severe plowing conditions are found and the strongest plows are in demand), these English firms do a very satisfactory business.

In the past few years several American firms have made great progress in improving and perfecting these plows for South Africa. There is every indication that our trade in them at least will be maintained in the future.

MEDIUM AND LIGHT TYPES.

By a medium-weight plow is meant a plow weighing 450 pounds and by a light plow one weighing 350 pounds. These plows, especially the former, have a very large sale in South Africa—perhaps larger than that of the heavy plow described in the preceding pages. These two plows are built, broadly speaking, along the lines of the heavy type, the chief difference being in their lighter weight. They are for conditions less severe and exacting than those obtaining where heavy plows are used. They are also largely bought by farmers who either possess a limited number of oxen or soils easier

to plow or who do not care to pay the price of the heavier plow. While such is not always the case, for the sake of giving a broad idea of the demand it may be said that the heavy plow is chiefly sold in the uplands, the medium type in the midlands, and the light plow in the lower lands. Of course, a great many farmers who are not situated in the higher lands, but who believe in using good implements for their work, buy the heavier implement.

The medium type can be accepted as being the standard type for the Orange Free State Province. It is supplied with two 12-inch bottoms at $60 and with two 14-inch bottoms at $61.50. The clevis shift device and the third bottom attachment are often required for this type of plow.

The light plow is supplied with two 10-inch bottoms at $50 and with two 12-inch bottoms at $51.50. No clevis shift attachment is supplied, nor the third bottom attachment. This plow is preferred when it can be adjusted to cut either 1 inch wider or narrower than the size of the share.

SINGLE-FURROW WHEELED MOLDBOARD PLOWS.

In some parts of South Africa there are sold a few single-furrow wheeled plows constructed along the lines of the gang plows described in the preceding pages. These have no rear wheel, and the draft is direct from the point of the beam. A rear handle is supplied. These are sold in 12, 14, and 16 inches, weighing 300, 350, and 400 pounds, and selling at $40, $42.50, and $47.50, respectively. In many respects the construction of the heavy gang plow forms the basis for that of this single-furrow plow. Only a few dealers sell such a plow, and in general it is not necessary for a manufacturer to build it to provide a full line of plows for the South African market.

OTHER WALKING GANG PLOWS.

For the trade in a few isolated districts several firms stock gang plows that differ in several respects from those heretofore described. Perhaps the plow most widely sold in this connection is a very heavy two and three furrow plow especially constructed to break virgin soil. The two-furrow plow is adjustable to cut from 16 to 24 inches, and the three-furrow plow from 24 to 36 inches. These weigh 675 pounds and 850 pounds, and sell for $95 and $105, respectively. They are supplied with either 8, 9, or 10 inch shares and with a long turning breaking moldboard—different, however, from the American type, owing to the narrow cut of the share. Plows of this description are almost entirely supplied by Canadian, Australian, and English manufacturers. The trade does not seem important enough to warrant their manufacture by American makers at the present time.

DISK PLOWS.

It is widely believed that South Africa's disk-plow trade equals in volume that in moldboard gang plows. If Rhodesia is included, it is not improbable that such is the case. It is to be regretted, in view of this, that American manufacturers have, relatively, a very

small share of that business. British manufacturers for many years have enjoyed practically a monopoly in the sale of disk plows, and it is only in recent times that adequate efforts have been made by American manufacturers to sell these in greater numbers. In normal years South Africa imports from 3,000 to 5,000 disk plows. Of these one English firm is said to supply about 75 per cent. The plow in question (see fig. 1) is chiefly preferred on account of its very strong and rigid construction. Otherwise it does not seem to possess any extraordinary features of superiority over those made by American manufacturers. The frame of that plow is particularly strong, and that feature in itself is largely responsible for the excellent reputation it enjoys. In addition to the beam or frame supporting the disk standards, this plow has another heavy beam or frame running, in a parallel position, from the hitch bar to about the center of the plow, just behind the center disk in the three-

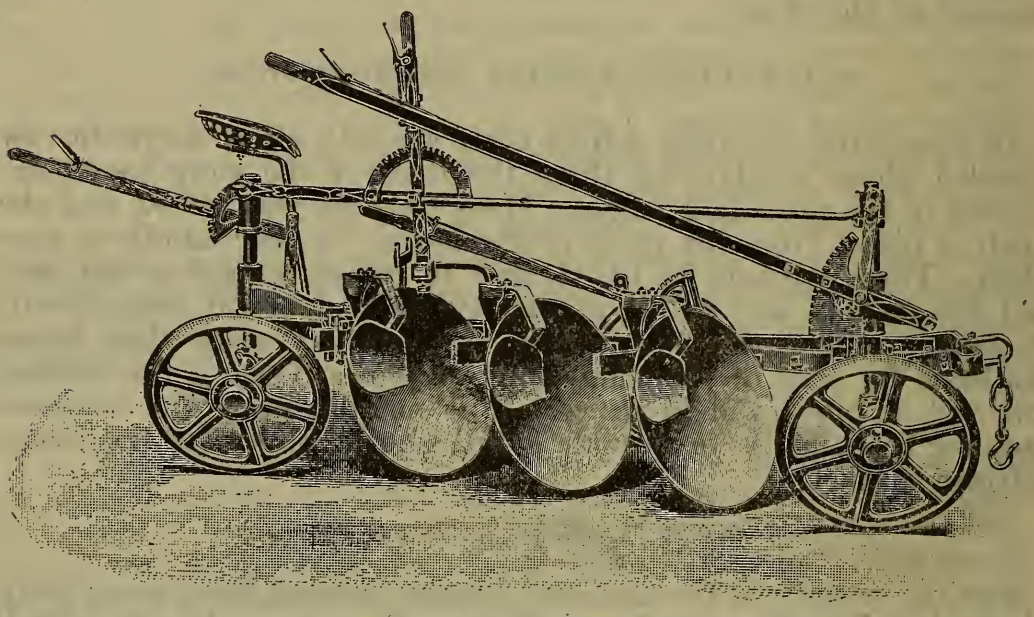

FIG. 1.—Three-furrow disk plow, made in England.

furrow plow. In other words, the frame may be said to be composed of these two beams, which are strongly braced and run parallel with each other as far back as the furrow-wheel axle. A very rigid and strong frame construction is thus obtained, which is much liked by the South African farmer.

At least two American manufacturers have recently produced a plow built on lines very similar to the English plow mentioned, and their enterprise in supplying exactly the type of disk plow that has proved satisfactory is certain to be adequately rewarded.

It should not be difficult for American manufacturers to increase their sales of disk plows in South Africa. Generally speaking, the only fault found with their goods is that they are not quite as rigid, strong, and substantially constructed as the requirements of the market make necessary. In most cases an increase of from 5 to 10 per cent in the weight and strength of some of the parts is all that is necessary. The utmost care should be taken to insure that all parts are sufficiently strong and to brace the frame so that the

utmost rigidity is maintained at all times. Some American disk plows already enjoy an excellent reputation because of their lightness of draft. Our manufacturers have the advantage of large outputs and standardized manufacturing methods that enable them to sell their product at prices more attractive than those quoted by English firms. This condition is felt acutely by importers of English goods, since they have to be contented with a very small margin of profit. They obtain a somewhat higher price for English disk plows, but the difference is not sufficient to compensate them for the higher prices that they in turn must pay to the manufacturers. Another factor in favor of the United States at this time is that the English firm doing the largest disk-plow business in South Africa has decided, in certain sections of the country, to ignore the regular importing organization in order to sell direct to the more important country dealers. Since the retail trade of South Africa is strongly controlled by the large coast importers, it is doubtful whether that maker will be able to have as many dealers selling his goods as he had when the business was handled through the coast importers. Another favorable factor is that a dealer must of necessity have a complete line of implements, including corn planters, for his trade. While English manufacturers have proved able to supply satisfactory disk and moldboard plows, disk harrows, and several other machines, they have not had the same success with maize planters and cultivators, so much in demand everywhere in South Africa. Such being the case, the coast importer is in an excellent position to sell American disk plows, because of the influence he can exercise when controlling the sale of a well-known American planter.

The majority of American disk plows sold in South Africa are built along the lines of those that are largely used in the Southern States and on the Pacific coast and are also supplied to the foreign trade. While, to some extent, certain American manufacturers have taken pains to supply plows capable of successful operation in a country that, like South Africa, is compelled to use native labor and oxen (plows that, in the hands of more intelligent operators, would be sufficiently strong), a good deal of effort still appears necessary to produce the substantial type of disk plow that will enable them to secure as satisfactory a share of the disk-plow trade of South Africa as that which they enjoy in other classes of farm machinery.

The demand is chiefly for two and three furrow disk plows weighing approximately 1,075 and 1,150 pounds, respectively. There is also a good demand for lighter disk plows. The principal feature claiming the farmer's preference, when he is purchasing a disk plow, is a very strong and rigid frame that will keep the plow solidly together. Light draft is also an important consideration, this feature of the American plows being highly esteemed. Other desirable features are quick adjustment of the disks to meet different soil conditions and strong wheels and axles with dust-proof and grease-tight arrangements. Above all, however, South African farmers look for a plow that can be successfully used in new and rough lands, and the parts of which are so uniformly strong that breakages under these conditions will be reduced to a minimum.

Throughout South Africa two and three furrow plows are most often used, the three-furrow leading all others. There are undoubtedly more four-disk plows sold than single-furrow plows, this being especially true in Rhodesia, where probably 80 per cent of all plows used are disk plows and the great majority of these are four-disk plows. Twenty-four inch disks are the standard equipment; 26-inch disks are rarely used.

The trade in disk plows of the lighter type is very small, indeed. The two-disk plow weighs 650 pounds and sells at $75. The three-disk weighs 775 pounds and sells at $90.

The medium-weight disk plow shares with the heavier type the amount of business done. The two-disk plow in this class weighs 900 to 975 pounds and sells at $75 to $90. The three-disk plow weighs 1,000 to 1,100 pounds and sells at $92.50 to $105. The four-disk plow weighs 1,150 to 1,225 pounds and sells at $125.

The heavier type of disk plow, which is much in demand, is sold with two disks, weighing 1,075 to 1,125 pounds and selling at $100; three disks, weighing 1,150 to 1,300 pounds and selling at $115 to $125; four disks, weighing 1,400 pounds and selling at $140.

REVERSIBLE DISK PLOWS.

There are a number of reversible disk plows sold in South Africa, chiefly in the sugar-growing districts of Natal and in the south-western part of Cape Province, where the land is often hilly. Throughout South Africa a few disk plows of this type are seen now and then. These plows are identical with those produced by American manufacturers. They weigh 475 to 600 pounds and sell at $55 to $75.

SULKY PLOWS.

The only sulky plow sold in South Africa (and this to a small extent) is a single-furrow frameless moldboard plow with 16-inch bottoms. This plow is identical with that which is largely used in California and Texas and which is also the most popular sulky plow used in Argentina. It weighs 400 to 450 pounds and retails at $50. Some firms stock and import these plows without either seat or rear wheel.

SINGLE-FURROW WALKING PLOWS.

The trade in these plows is not as important as many may be led to suppose, in view of the backward conditions prevailing for many years in South African farming. To a very great extent their sale is confined to the native districts and for orchard, vineyard, and sugar-cane cultivation. In some cases, however, the soil is so hard and difficult to handle that single-furrow plows are used because of the large teams that would be required to operate larger plows. Outside of the native trade and for sugar-cane cultivation, the demand is for the better class of steel single-furrow plows. The cost of one of these, however, when equipped with a forecarriage of the elaborate type so often used in South Africa, closely approaches that of a wheeled gang plow, and to this fact must be attributed, in a measure, the small demand for walking plows.

The natives use almost exclusively a single-furrow moldboard plow, which, as though by an unwritten law, must be sold at a price not exceeding $12.50, equipped with gauge wheel. Wood-beam-and-handle plows with cast-iron bottoms were largely sold to natives until a few years ago. The present demand is for all steel or iron plows that can be purchased at the price mentioned. The native will prefer a steel-beam plow, even though it may cut a narrower furrow, to a wood-beam plow selling at the same price.

A light pony plow with wood beam and handles, steel standard, solid steel general-purpose moldboard, share, and landside, to cut 8 inches wide, is largely sold. This weighs 50 pounds and retails at $7.50. It is extensively used for light work such as sugar-cane and vineyard cultivation. A good many of these are to be seen in the native districts, and they are also used by some of the less progressive white farmers. Many of them are sold to Rhodesian natives. They are supplied with gauge wheels, and six complete plows are shipped in a box.

Another type, which is rapidly taking the place of the wood-beam pony plow, is a light one or two horse plow with steel beam and either wood or steel handles. This is used by small farmers and by a good many natives. It is supplied with gauge wheel and sold mostly in 7, 8, and 9 inch sizes, weighing 55, 65, and 75 pounds, respectively, and retailing at $8.50, $10.50, and $11.50. Some importers supply a somewhat heavier plow, for which $1.50 more is paid. Six complete plows are packed in a box.

For the better trade a medium-weight single-furrow plow, for two or three horses, with steel beam and with either steel or wood handles, is largely sold. It is used for general work, including breaking virgin soil and weedy and thrashy lands. The gauge wheel is set well forward in the beam to make the plow run steadily on rough and uneven ground. The beam is preferred somewhat longer than usual and high arched to allow ample clearance. A few 16 and 18 inch plows of this type are sold, but the trade is mostly in the 10, 12, and 14 inch sizes. The bottoms generally sold with these plows are of the general-purpose type, with soft-center steel moldboard and crucible-steel share and landside. In some cases these plows are equipped with soft-center steel shares, for which an extra price is paid. They are always supplied with gauge wheel. The 10-inch size weighs 115 pounds, and sells at $15.50, the 12-inch size weighs 130 pounds, and sells at $18, and the 14-inch size weighs 150 pounds, and sells at $23.50.

The most expensive and substantially constructed single-furrow walking plow sold in South Africa is a 14-inch plow for lands in a very rough state and only partly cleared of roots and stumps. Eight to 12 oxen are required for it. It is also largely used for very hard ground, deep plowing, and especially for the heavy gumbo soils often found in small pockets in many parts of South Africa. This plow is always equipped with a loose or gallows forecarriage of a heavier construction than that used for the lighter walking plows. Extra heavy steel beams and handles, heavy knife coulter, soft-center steel moldboard, with a steel moldboard extension, and soft-center shares and landsides are supplied with it. The plows for this work furnished by English manufacturers have a heavy iron beam instead of the steel beam. This plow weighs, complete with

the equipment indicated, 325 pounds, and it sells for $35 to $40. There is a limited sale for a somewhat lighter plow, weighing 250 pounds and selling at $30. Both these plows are equipped with steel runners attached to the end of the left handle, to assist in their transportation when the plow is turned on its side.

HILLSIDE PLOWS.

There is quite a fair demand for walking hillside plows. One of these is a light-weight plow equipped with wood beam and handle, solid steel share and moldboard. Ordinarily no steering attachment is provided, but it always has a foot-locking device. Gauge wheels are part of the regular equipment. Two sizes are generally imported, either 9 to 10 inches, or 11 to 12 inches, weighing, respectively, 90 and 120 pounds, and selling at $8.50 and $12.50.

A somewhat heavier hillside plow is also in demand. It has a steel split beam and steel or wood handles, and is equipped with a steering device to adjust the beam to the line of draft in order to regulate the width of the furrow. It is equipped with either steel or cast shares, steel moldboard and gauge wheel. Four or 6 of these plows are packed in a box for shipment. The 12-inch size weighs 175 pounds and retails for $20, and the 14-inch size weighs 185 pounds and sells for $21.50.

BREAKING PLOWS.

A few prairie breaking plows are sold. These have a strong wood beam, reinforced with steel straps, solid steel share, moldboard and landside, rolling coulter, and gauge wheel. They are preferred when equipped with a steel draft rod and dial clevis. The 12-inch size weighs 125 pounds and sells at $21.50, and the 14-inch size weighs 150 pounds and sells at $23. The trade in these is unimportant and English and American manufacturers divide it among themselves.

RIDGING AND MIDDLE-BREAKER PLOWS.

Ridging and middle-breaking plows are sold to a limited extent in Natal and where irrigation is practiced. One of the types sold has wood beam and handles and weighs 75 pounds. With gauge wheel it sells for $8. Another type in demand is very much heavier and stronger, being built with an iron beam and wood handles and weighing 175 pounds. This plow is intended for ridges up to 28 inches wide at the top and 10 inches deep. With gauge wheel it sells at $25. Another heavy middle-breaker plow entirely constructed of iron and steel is sold in fair numbers. It has a moldboard adjustable for ridges 20 to 30 inches wide at the top and it is fitted with either single or double gauge wheels. The ridging bottom can be removed and a set of potato diggers put in its place. Without the potato-digger attachment it weighs 150 pounds and sells at $25.

EQUIPMENT OF WALKING PLOWS.

In some cases gauge wheels are sold as extras, and for this reason it is preferable that manufacturers quote separate prices for plows and for gauge wheels. Single-stem gauge wheels are rapidly being discarded for those with a double stem.

On the better types of walking plows a substantially constructed steel runner or steel gliding shoe is attached to the upper outside end of the left handle to assist in the transportation of the plow when it is turned on its side.

Coulters are generally sold as extras, the knife coulter at $1.75 and the rolling coulter at $4 to $5.

The land sides of all single-furrow plows are equipped with a removable slip heel.

With very few exceptions, the moldboards for all types of plows sold in South Africa are of the general-purpose type, for turf and stubble work.

Soft-center steel, crucible steel, chilled cast iron, and plain cast shares are largely supplied as extras for walking plows.

It is almost the universal rule to ship six complete plows in a box to South Africa.

FORECARRIAGE FOR WALKING PLOWS.

A large number of walking plows are sold with either a rigid or loose forecarriage. This is necessary on account of the rough nature of the ground and because of the unsatisfactory plowing otherwise done by natives. The forecarriage makes the plow steadier and easier to handle, and also assists in making furrows of uniform depth and width.

The rigid type of forecarriage consists of two upright square steel posts fastened to a crossbar or axle on which the plow beam either rests or hangs. To the lower end of these posts the wheels are attached. The land wheel is movable up and down to regulate the depth of plowing. This forecarriage should be constructed to permit setting the plow for a depth of 10 inches. The most recent types of forecarriages can be changed from rigid to loose by means of a latch operated by a string that is held on the handle brace. When the string is pulled the latch is released and the plow beam becomes loose, which facilitates taking the bottom out of the ground and the transportation of the plow. These forecarriages weigh 45 to 50 pounds and sell at $5 to $6.

The gallows or loose forecarriage is somewhat more substantially constructed than that of the rigid type. In this case a positive arrangement to allow the beam to swivel independently of the forecarriage axle is part of its construction, so that the plow may be easily turned on its left side. In general the construction is similar to that of the rigid forecarriage, with the advantage, however, that greater flexibility is obtained. It weighs 70 to 75 pounds and sells at $7.50 to $10. Since the rigid type of forecarriage has been designed so that it can be easily changed into a loose forecarriage, the necessity for providing this type has diminished. At any rate, its use is practically confined to the heavy walking plow for breaking gumbo and hard soils.

CHILLED WALKING PLOWS.

The demand for chilled plows is very small and almost entirely confined to the native territories and the southwestern districts of Cape Province. Comparing Rhodesia with the Union, it may be said that chilled plows are used in the former country where steel plows

would be used in the latter. The most popular chilled plows in South Africa can be classified under three headings, as follows:

Light type with wood or steel beam, wood handles, and gauge wheel; 9-inch cut weighs 80 pounds and sells at $7.50, 10-inch cut weighs 90 pounds and sells at $9.50.

One-horse light plow for vineyard work, with adjustable wood beam, wood handles, and gauge wheel; 9-inch cut weighs 70 pounds and sells at $9, 10-inch cut weighs 80 pounds and sells at $10.

Two-horse plow, with wood or steel beam, wood handles, gauge wheel, cutter share or slip nose share; 8-inch weighs 110 pounds and sells at $12.50, 9-inch weighs 130 pounds and sells at $13, 10-inch weighs 140 pounds and sells at $15, 12-inch weighs 170 pounds and sells at $16. Fore-carriages, rolling coulters, and standing coulters are often required for these plows.

ENGINE PLOWS.

Plows for gas and steam tractors are not regularly stocked by South African firms. Those so far sold for this work are about equally divided between disk and moldboard plows.

GERMAN PLOW TRADE.

There appears to be much misunderstanding concerning the importance of the trade done by German plow manufacturers in South

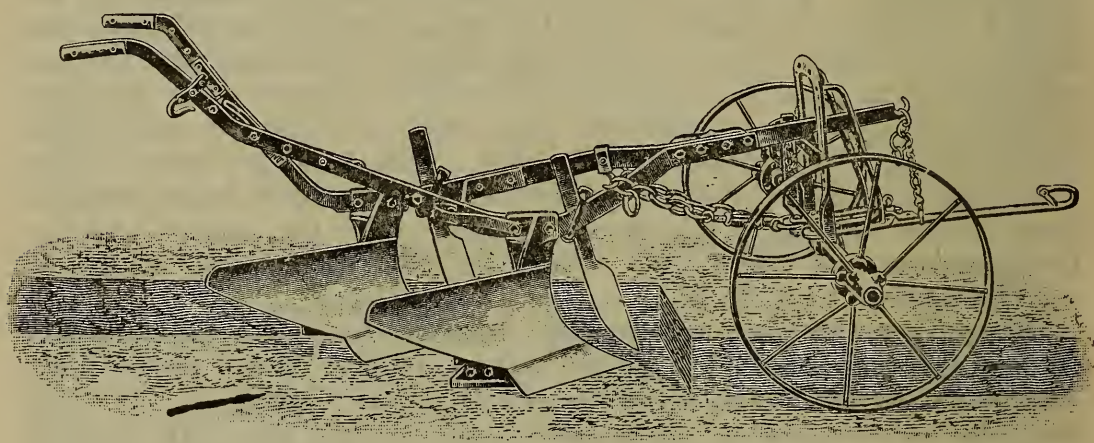

FIG 2.—Double-furrow plow, made in Germany.

Africa, especially in the southwestern part of Cape Province, where their goods are most often seen. According to the official customs returns of the Union, the value of all agricultural implements, other than dairy utensils, hoes, and picks, imported from Germany during 1913 amounted to $113,029. As these figures indicate, the German trade has not been very large.

The most popular German plow sold in South Africa is a two-furrow plow with a loose fore-carriage, fitted with two 10-inch bottoms and equipped with standing knife cutters and steel handles (see fig. 2). This plow is light in weight but is built entirely of steel. The pull is made with a double chain, the ends of which are hooked to either side of the double frame to which the bottom standards are

attached. The chain is fitted with a turnbuckle to shorten or lengthen it in order to adapt the plow for uneven ground. The standards supporting both bottoms are attached to the long beams, which extend from the front of the plow to the handles in one single piece, making any levers unnecessary. This places this particular type of plow more in the category of single-furrow plows than in that of gang plows. It is becoming so popular that there are nearly half a dozen imitations of it sold in South Africa. As it is often considered necessary to give an importer a full plow line, it would seem that a fair business could be done by a manufacturer who undertook to build something along that line and job them out, under different trade names, to other American manufacturers interested in South African trade (just as some of our manufacturers handle chilled plows made by other firms). These plows weigh 230 to 260 pounds and retail at $24 to $28. They are shipped packed three in a box. The standards

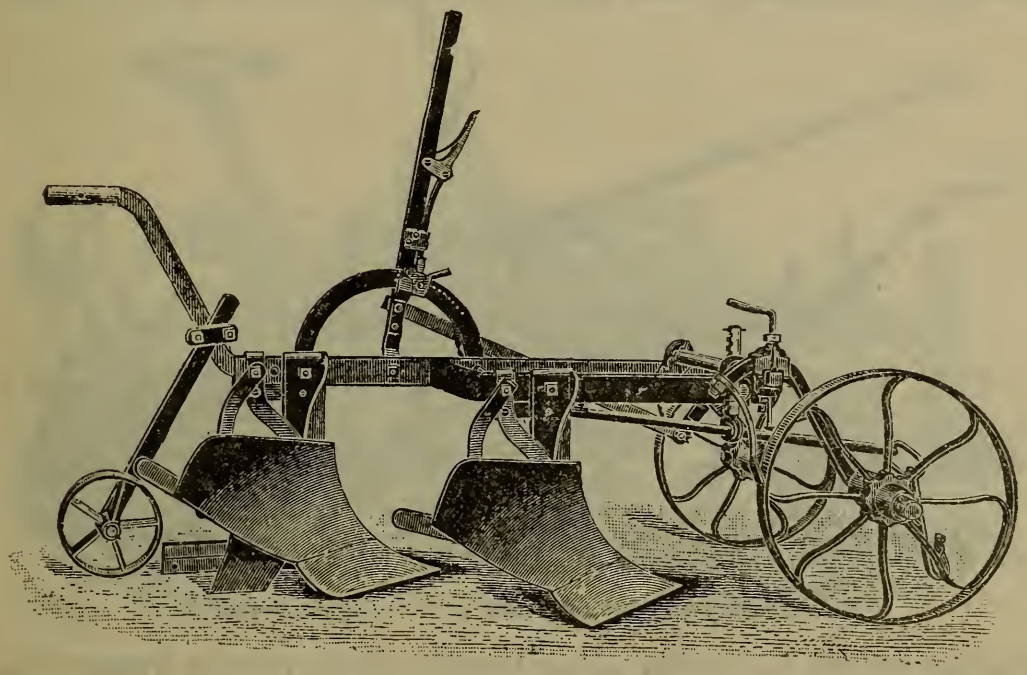

FIG. 3.—Double-furrow walking plow, made in Germany.

to which the bottoms are attached are made of cast steel; the share is made of crucible steel and the moldboard of soft-center steel. Solid steel shares for these plows retail for $0.75. The utmost depth at which these plows are expected to plow is 8 inches, but ordinarily they are used to plow about 4 inches deep.

Another plow of German origin largely sold in South Africa is a two-furrow wheeled gang plow made of steel throughout, with forged steel standards, soft-center steel moldboard, and crucible steel shares (see fig. 3). The front wheels work on a common crank axle moving together backward or forward by the operation of a lever. The chief feature of this plow is its small number of wearing parts. It weighs 250 to 280 pounds and retails for $30. It is built to cut either 20 or 24 inches at a maximum depth of 9 inches on easy soil. Two plows are packed in a box.

For light work, to plow from 1½ to 6 inches, chiefly to work fallow lands and to plow up broadcast-sown lands, a three-furrow plow with

9-inch bottoms, weighing 340 pounds and retailing at $40, is largely used in the southwestern part of Cape Province (see fig. 4).

It is understood that one or two American firms have lately undertaken the manufacture of plows along lines similar to those of the plows supplied by Germany heretofore. Since the farmers in the Cape Town territory have long been accustomed to that type of plow, the demand will undoubtedly continue as long as they can be purchased. On the other hand, owing to the inability of German manufacturers to supply their agents in that country, making it difficult for farmers to procure the plows since the war started, there is afforded at present an exceptional opportunity to introduce light gang plows made by American manufacturers that will correspond to the German plow in price, weight, and width and depth of plowing performed. It must be noted that the prices given above were those prevailing before the war. South African farmers will undoubtedly understand that agricultural implements offered at this

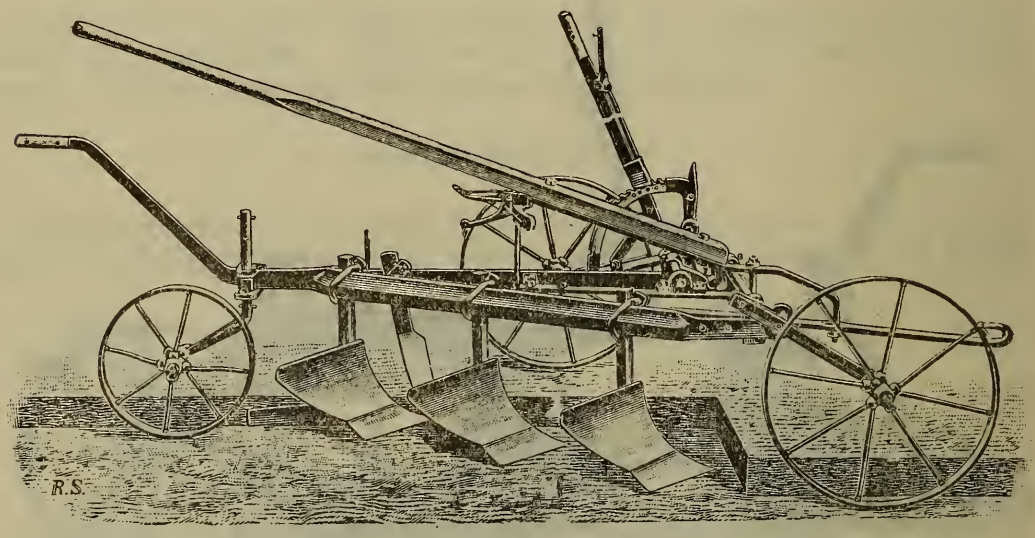

FIG. 4.—Three-furrow fallowing plow, made in Germany.

time are selling for higher prices because of the present greater cost of material.

It is believed that the plows of German origin mentioned above are largely used in several European countries. If American manufacturers planning to produce them for South Africa will exploit the European trade as well, the construction of such plows may yet result in an attractive and profitable business.

HARROWS.

According to the census of 1911, the number of harrows of all kinds then in use in the Union of South Africa was 68,125. Few of these were disk harrows. Even to-day the great majority of harrows seen in South Africa are tooth harrows, and these of a somewhat inferior type.

DISK HARROWS.

Disk harrows are oftener seen in Transvaal and Natal Provinces than elsewhere in South Africa. The demand is rapidly increasing,

and in a few years they will undoubtedly be used by the majority of farmers in these two Provinces. In the eastern districts of Orange Free State disk harrows are also frequently seen. In the southwestern districts of Cape Province it is rather the exception than the rule to find them, whereas the demand in the eastern districts of that Province is rapidly growing. While exact information is unobtainable, various estimates place the number of disk harrows sold in South Africa at 1,000 per annum.

American manufacturers do not have the same proportionate share of the disk-harrow business that they have as regards other machines. It is generally conceded that English manufacturers, their principal competitors, sell a much greater number of these. The English disk harrows (see fig. 5) are heavier and stronger, and these

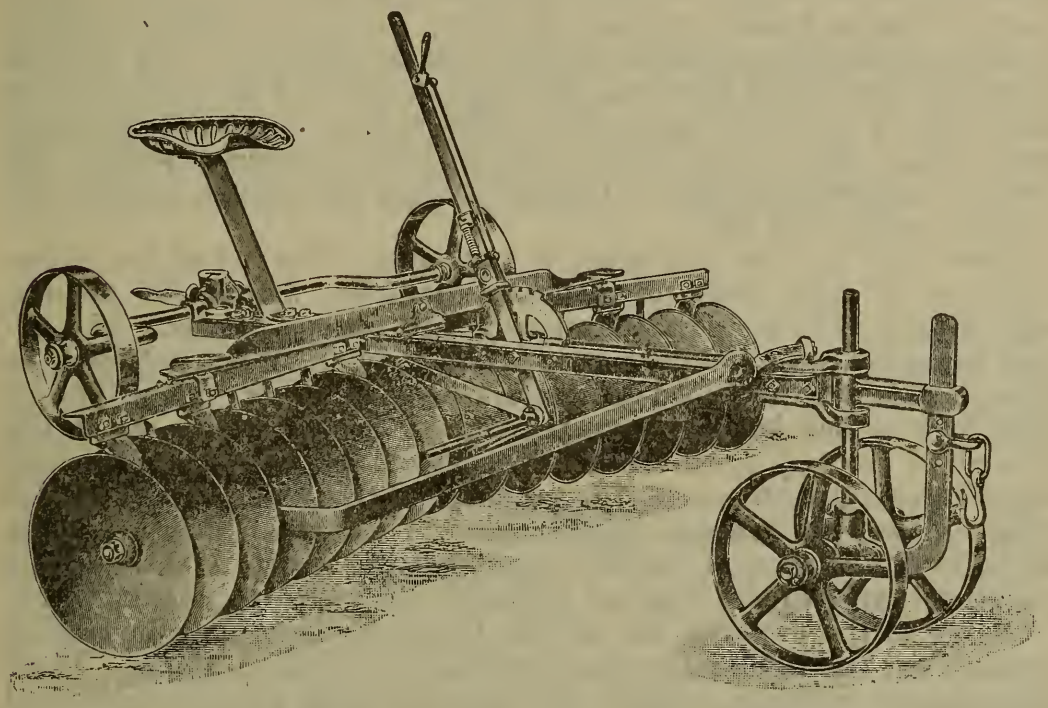

FIG. 5.—English disk harrow.

qualities are necessary for the work to be done in South Africa. The transport truck of these machines is self-contained in the harrow. Its wheels are built on a wide crank axle and the truck can easily be put upon the harrow, thus helping to keep the disks on the ground when the machine is at work. They take the place, so to speak, of the weight boxes. This truck is easily released for transport purposes. The disk gangs are so constructed that they pivot in the center and can be turned around to a position parallel with the team, in which manner they rest upon the transport wheel axles. The harrow, consequently, can be folded for transportation. Two American manufacturers have lately built disk harrows very similar in design. This will undoubtedly cause an increase in our disk-harrow trade in South Africa.

Spading harrows, built on a frame like that of the disk harrow, are sold by a few firms. Eight-foot cut is the only size sold, weighing 650 pounds and retailing at $60.

ALFALFA HARROWS AND CULTIVATORS.

Quite a number of alfalfa harrows and cultivators have been sold in South Africa in the past. The chief type in demand was that which American disk-harrow manufacturers make, using a disk-harrow frame—with spikes, however, instead of disks. Very few of these are now sold. The depression of the feather market partly accounts for this, although the chief reason why this machine is going out of favor is that the teeth or spikes rapidly lose their sharp points when cultivating alfalfa in the hard soils often encountered in South Africa. This causes the dull spikes to push or press the alfalfa heads into the ground, thus destroying the vitality of the plants and preventing their further growth.

Weight boxes and transport trucks are part of the regular equipment. Tongue trucks are sold as extras for nearly every machine. Broadcast alfalfa seeders are used in certain districts. The demand is chiefly for 6-foot harrows, although 4 and 8 foot machines are also sold. The 4-foot harrow has eight wheels, weighs 600 pounds, and sells at $65. The 6-foot harrow has 12 wheels, weighs 650 pounds, and sells at $75. The 8-foot has 16 wheels, weighs 925 pounds, and sells at $95.

These disk harrows are made in two sizes. The 8-foot has either cut-away or plain disks, 18 inches in diameter, weighs 750 pounds, and sells at $85, including transport and tongue trucks. The 10-foot harrow weighs 850 pounds and sells at $100. When cut-away or 20-inch disks are supplied an extra charge is made. This type of disk harrow has become very popular in South Africa, as it has proved to do very good work when heavy soil conditions prevail. American manufacturers desiring a share of this trade will do well to follow closely its general construction. A Canadian firm has made an exact imitation of it, to the extent that the South African agents use electrotypes of the original machine in advertising the imitation.

Owing to the growing use of disk harrows, there is an increasing demand for the lighter machines made in the United States. These are equipped with plain disks, but cut-away disks are often supplied at the same price. Eighteen-inch disks are the most widely used, 20-inch disks are supplied to some extent, and 16-inch disks are rarely met with. The majority of harrows are equipped with tongue and transport trucks, for which $10 and $7.50 additional are charged. For stub poles $1 extra is charged. In some districts a center shovel attachment to work between the two disk gangs is required, and $3.50 extra is charged for it. Weight boxes are part of the regular equipment. Strong axles, frames, and scrapers are necessary features. Eight and 9-foot disk harrows are in greatest demand. The most popular harrow of this type weighs 575 pounds and 625 pounds and retails at $60 and $70, including transport and tongue trucks. Six-foot disk harrows weighing 500 pounds and selling at $45 are sold to some extent. Ten-foot disk harrows are seldom seen. Broadcast-seeder attachments are wanted in certain districts, but on the whole the demand for these is small.

In proportion to the number of disk harrows sold there is quite a demand for tandem attachments for these. They are equipped in about equal numbers with either plain or cut-away disks. These attachments are sold chiefly for the 6 and 8 foot harrows.

In Natal some light disk harrows to cultivate between wattle trees and for other light work are sold. These are furnished without seat and with either cut-away or plain disks, at the same price. Most in demand are the 4-foot cut, with 20-inch disk, weighing 340 pounds, and selling for $37.50, and the 5-foot cut, weighing 375 pounds, and selling for $40.

For orchard, vineyard, and general field cultivation, a few reversible disk harrows are sold. These are supplied with seat and are adjustable for in-throw and out-throw cultivation. Harrows with ten 16-inch disks, weighing 425 pounds, and selling for $40 are those mostly sold.

Alfalfa is a popular crop in South Africa and farmers think much of it. Often considerable expenses are incurred to establish alfalfa under irrigation. Efficient implements for alfalfa cultivation are certain always to meet with a ready demand. Most South African farmers feel that as yet a machine has not been produced that will cultivate alfalfa in a thoroughly effective manner. Our manufacturers should bring to the attention of South African farmers and importers any new machines they may produce for this work. Disk harrows are extensively used at present to cultivate alfalfa.

SPIKE-TOOTH HARROWS.

A great many different spike harrows are sold in South Africa. This is an implement that is found on every farm. Diamond and zigzag disk harrows, without levers, seem to be the most popular. There are, however, a good number of lever harrows sold. A cheap but strong implement is required.

Two, three, and four section zigzag and diamond harrows, weighing 120, 150, and 250 pounds and selling for $15, $18.50, and $25, respectively, are the most popular. The competition of English and German firms has been very keen. Sweden has recently supplied an increasing number of these harrows.

Two and three section lever harrows, almost equally divided between the U-bar and the "pipe"-bar types, weighing 270 and 350 pounds and selling at $23 and $30, respectively, are sold in increasing numbers.

SPRING-TOOTH LEVER HARROWS.

For the cultivation of alfalfa and orchards and for general field work, spring-tooth lever harrows are increasing in popularity. Frame of angle steel with good rear clearance, adjustable teeth that can be set by the levers at different angles, and reversible points are features found in the most popular spring-tooth harrows sold. The two-section harrow with 23 teeth, weighing 275 pounds, sells at $30. Transport attachments are often required. These add $7 to the price.

ANTICLOG WEEDERS.

Anticlog weeders are sold in the 8 and 12 foot sizes at $18.75 and $32.50, respectively. They are generally equipped with wood handles and removable teeth. A number of riding attachments, weighing 100 pounds and selling at $12.50, are sold with them.

DRAGBAR ALFALFA CULTIVATORS.

There is beginning to be a demand for dragbar alfalfa cultivators. The size mostly sold is the 6½-foot, fitted with 14 teeth, which weighs 500 pounds and sells for $80. It has a spring pressure arrangement, and in some cases it is fitted with a grain and grass seeder.

ROLLERS AND PULVERIZERS.

The demand for rollers and pulverizers is small at present, but the increasing interest in dry farming will probably bring about a greater use of them in the future.

CORN PLANTERS.

Since the growing of maize is the most important branch of South African farming, it follows that the demand for corn planters is of considerable importance. In the Transvaal, in particular, and to a large extent also in the Orange Free State, two-row planters are to be found on nearly every farm. It is a feature of the demand that whenever these machines are used the most improved two-row types are to be seen. It is estimated, however, that at least 35 per cent of the maize grown in South Africa is sown broadcast. This is chiefly the case in the most backward districts of the Orange Free State, eastern Cape Province, and in the native areas. Planting corn behind the plow is still done by some Boer farmers and by natives, particularly when new land is brought under cultivation. On sandy soils the natives often throw the seed on the ground and plow the land afterwards.

The American type of corn planter has proved altogether satisfactory for South African conditions. A preference is shown for machines strongly built and simple in design. The bulk of the trade is in two-row planters with center hole plates. In some sections, however, edge drop plate planters are sold in small quantities. It can not be said that South African farmers are careful enough in grading their seed corn, and under such circumstances the center hole planter has proved more satisfactory. Nearly 85 per cent of the corn planters shipped to South Africa are equipped with fertilizer attachment. This should be provided with a positive double agitator, a feature especially desirable when using kraal manure. For the same reason large hoppers will often be preferred.

Very few check row planters are sold, but it is quite likely that this type of planter will increase in popularity in the future. When check row planters are supplied, wire should be provided to drop the seed at intervals of 36 inches. There is a very small call for wire to drop the seed at intervals of 30 inches.

There are no precise rules as to the distance between the rows in corn planting. American machines, however, are generally adjustable to meet the varying ideas of South African farmers in this regard. From all indications the great bulk of planters are adjusted to plant from 3 feet to 3 feet 6 inches between the rows, and from 8 to 24 inches in the rows. Planters are often used in Natal to plant 30 inches between the rows and from 12 to 18 inches in the rows. Generally speaking, 19 or 20 pounds of seed corn are planted to the

acre. Leading corn growers advocate planting at a depth of 4 to 5 inches, and this is being widely done.

Knife or runner openers are generally used. There is also a fairly good demand for single-disk openers and a smaller one for double-disk openers.

All planters should be equipped with a full set of plates, including plates for Hickory King and Kafir corn. The sunflower plant is being increasingly grown in some parts of South Africa, especially in the Transvaal and Rhodesia, and suitable seed plates should be furnished when called for. Soya-bean plates and turnip attachments are also required in a few cases. For Rhodesia and a few other parts of South Africa, plates must be supplied for peanuts or monkey nuts. A blank plate should in all cases be shipped as a part of the equipment of the machine.

Tongue trucks, built along the lines of those used in disk harrows, are desired by a growing number of farmers, especially when oxen are used to drive the planters. Two-horse eveners for corn planters are generally supplied as extras.

One of the most popular two-row corn planters sold in South Africa weighs 350 pounds and retails for $55. The fertilizer attachment increases the price to $75. Check-row planters sell for about $75.

Two-row planters are packed one in a box, but a number of cases have been noticed where a box containing two planters has been preferred by the importer. It seems that in most cases the packing of two planters in a box makes possible a substantial saving in the cost of ocean freight. The manufacturers should always pack their machines in the smallest possible cubic space.

THREE-ROW CORN DRILLS.

A few three-row corn drills are sold, mostly in Natal. They are identical in construction with those that American manufacturers supply for the Argentine trade. They are equipped with double markers and must be adjustable to plant from 30 to 34 inches apart. One of the most popular makes of this type weighs 600 pounds and sells for $100.

SINGLE-ROW PLANTERS.

The trade in single-row planters is relatively small. Both chain and gear drive planters are used, and these are also often required with fertilizer attachment. The remarks made in connection with plates for two-row planters apply to the equipment for single-row planters. These planters weigh 100 pounds and retail for $20 to $22.50. The fertilizer planter weighs 130 pounds and sells for $30. It is customary to pack six machines in a box.

COMPETITION IN CORN PLANTERS.

The competition to be met by American manufacturers of corn planters is insignificant. English firms have made considerable efforts in recent years to produce satisfactory machines of this type, and in at least one case a very good planter has been produced by them. It is generally conceded, however, that American manufac-

turers have little to fear from competition; the future trade will continue largely in their hands.

It is desirable that the importance of corn planters as a leading tool for the South African trade should not be lost sight of by our manufacturers. A satisfactory corn planter will often enable a manufacturer to place and introduce some of his other lines, which otherwise might prove a much more difficult thing to accomplish.

MAIZE CULTIVATORS.

It can not be said that South African farmers have learned to appreciate the advantages of using corn-cultivating machinery of the latest type. They have shown an incomprehensible backwardness in that respect, considering that, in general, they use the most advanced types of corn planters. No definite types of cultivators have so far been adopted as standard by the farmers of the country. A great many different varieties are stocked by dealers, but the majority are of the one-horse scarifier type. In the last two or three years, however, there has arisen a demand for walking arch cultivators such as are largely used in Texas and other cotton-growing States—equipped, however, with 8 shovels, and in a few cases with 10 shovels. The favor with which that style of cultivator is being received warrants the prediction that it will probably become one of the standard types among South African corn growers.

The advent in America during the last year of the two-full-rows, single-arch cultivator has been hailed by a number of South African farmers as making available at last the type of cultivator that they have been awaiting for many years. The use of such a cultivator will lessen the acuteness of the labor difficulties; it will induce many farmers to cultivate their maize crop more effectively than heretofore and will also make it possible for them to increase their acreage under that crop.

At the present time one-horse cultivators and scarifiers are the machines chiefly used to cultivate corn. As a low-price machine, a five-shovel cultivator with wood or steel handles, and without expanding lever, is largely used. This has an adjustable gauge wheel and is equipped with four 3½-inch reversible points and an 8-inch furrower in the center. This machine is particularly popular in Natal for cultivating sugar cane. It weighs 60 pounds and retails for $7.50. Ordinarily 10 of these cultivators are packed in a box. A similar machine equipped with five or seven shovels, but of a somewhat heavier construction, generally fitted with steel handles, gauge wheel, horse-hoe attachment, and expanding lever, is also very popular for corn-cultivation. Its retail price ranges from $8.50 to $10.

Fourteen-tooth cultivators or harrows with expanding lever, steel handles, adjustable and reversible chisel or diamond-shaped teeth, are also often in demand. They weigh 65 pounds and retail at $8. In some cases these cultivators are supplied with rear wheel. Spring-tooth cultivators with seven adjustable teeth are also in moderate demand.

The regular type of arch-walking cultivator, such as is largely used in the southern United States, has become very popular in recent years. The demand is chiefly for machines equipped with 8 or 10 shovels, and with a range of adjustment to cultivate from 36 to 54

inches. Round shank, pin break gangs are almost exclusively sold. When equipped with 8 shovels this machine weighs 270 pounds and sells for $32.50; the 10-shovel machine weighs 280 pounds and sells for $35. Two machines are packed in a box.

During the past two years quite a number of disk cultivators have been sold in South Africa. The types used throughout the United States have been found satisfactory.

Nearly all other types of cultivators are to be seen in South Africa, but the trade in them is relatively unimportant.

CORNSTALK CUTTERS.

The revolving cylinder type of stalk cutter is little known in South Africa, and it is doubtful whether a dozen of these machines are in use in that country to-day. The necessity for cutting down maize stalks, to plow them under, seldom occurs, because of the practice of letting the cattle eat them off before plowing. On the other hand, there is a small demand for stalk cutters that will cut maize stalks at the base without cutting them into small pieces, so that they can be gathered afterwards and stacked for feeding purposes, whenever it is desired to make the fields ready for plowing soon after the harvest. A few of these machines are sold. Those most in favor cut two rows at a time and are furnished with a well-built truck and platform, between the two knives.

GRAIN DRILLS.

The use of grain drills by South African farmers can be said to be a comparatively recent development. The demand, therefore, is still very small, and in all probability the sales during any one year have never so far exceeded 200 machines. It is difficult to account for the rarity of grain drills in the southwestern districts of Cape Province, the chief growing section of South Africa. A much greater number of drills, comparatively, are sold in the wheat districts of Orange Free State and Transvaal Provinces.

So far there has not arisen any particular reason why drills for South Africa should be different from those supplied to American farmers. Like other machines, however, they should have an ample margin of strength and be as free as possible from complicated mechanism.

Both single and double disk openers are sold. Double-run force feed, strong steel frame, steel wheels with wide rims, and independent acting disks forced into the ground by spring pressure are features found in the drills most in favor. Drills with 11 and 12 openers, 7 inches apart, are the sizes most largely sold, although a few machines somewhat larger are imported. In all probability 75 per cent of the drills sold in South Africa are fertilizer drills. Grass-seed boxes are sold in a few cases. One of the most popular 11 by 7 single-disk drills weighs 1,000 pounds and sells for $135. The same drill with fertilizer attachment sells for $175.

One-horse five-disk drills, of the ordinary type, are sold in increasing quantities, although the trade is still as small, relatively, as that of the larger drills.

Efforts in making farmers acquainted with the advantages of using grain drills would tend to enhance the demand. Several Cape Town

merchants have heretofore frequently advertised and demonstrated their drills without much success. It is doubtful whether such efforts will be vigorously continued unless the manufacturers themselves lend their assistance and encouragement. While a really notable trade in drills in South Africa can not be expected, yet it seems reasonable that a demand for several hundred drills per annum could be created. It is felt that manufacturers would be justified in making some efforts to develop that trade. Drills form another line in the introduction of which the services of a representative able to take a hand in demonstration work would prove of value. With the exception of a few machines made in Australia, the demand for drills is supplied almost entirely by American firms.

BROADCAST SEEDERS.

A number of wheelbarrow grass seeders are sold for sowing alfalfa, timothy, and clover, as well as some 8-foot broadcast sowers for wheat and other small grains. Disk harrows are also equipped at times with broadcast seeders for small grain. The trade in all these machines, however, is unimportant at the present time.

POTATO DIGGERS AND HARVESTERS.

Various machines for potato digging are seen in South Africa, but the aggregate demand is rather small. The majority of potato diggers sold are of the plow type with shaker rods and such as can be converted into ridging plows. A few elevator digging machines are disposed of from time to time. The business in this line is very small, and there is no justification at present for manufacturers to make any efforts, other than by correspondence, to get a share of the business.

POTATO PLANTERS.

It is doubtful whether a dozen potato planters are sold in South Africa per annum. Manufacturers of these machines can expect only a slowly growing demand. American makes of potato planters are satisfactory for the South African trade, although English manufacturers are also securing some business in that line. Fertilizer attachments are supplied with almost every machine.

THRASHERS.

The total number of thrashers sold in South Africa is not large. English thrashers have a good hold on the market, particularly in the larger sizes. American thrashers, in any considerable numbers, began to be sold only a few years ago. The trade is mostly confined to the southwestern districts of Cape Province, where the bulk of South Africa's small cereals are grown. As a rule farmers do not own thrashers. Thrashing is ordinarily done by contractors with itinerant outfits, going from farm to farm. The towns in the wheat-growing areas have large thrashing mills, and farmers who cultivate only small acreages cart their crop there to be thrashed.

The sizes most largely sold in South Africa are 3, 3½, and 4-foot machines. The preference for English thrashers is due to the fact

that they are constructed so as to stand better the rough usage that they receive at the hands of the labor employed in South Africa and the traveling over the poor roads in the country districts. Heavy wheels and axles, as well as rigid and strong frames, are very important features. Most of the large machines are equipped with grading and bagging attachments. Heavy belts are also insisted upon. Very few American thrashers of large capacity have been sold in South Africa, and these have not given satisfaction. Their large output and general design impressed their purchasers very favorably, but their construction would not stand up to the rough handling. It would seem that there is scope for the manufacture in America of thrashers that will withstand these severe conditions. A market for them would be found not only in South Africa but, apparently, in many other countries as well. The increased cost of building this higher-grade machine would undoubtedly be paid without reluctance by the farmers of those countries.

During the past two or three years a number of medium-size thrashers of American manufacture have been placed in the Cape Town territory. These have, in the main, been purchased by individual farmers to thrash their own crop and, in some cases, that of their immediate neighbors. They have 24 and 30-inch cylinders. Straw chopper and bruiser attachments for these and for the larger sizes are sold.

There is some demand for hand and power stationary thrashers with 14 and 18 inch cylinders. These are sold in the districts where wheat is not grown in large quantities, and only by individual farmers, and where it would be too costly on account of the distance for large itinerant outfits to be engaged, because of the amount of travel required to do only a few hours' work.

In Rhodesia there is an urgent demand for low-priced peanut thrashers, as well as for machines to thrash sunflower seed. The present method of thrashing sunflower seed is to have the heads knocked over by a revolving bicycle wheel. The machines need to be suitable for the use of individual farmers, who grow these crops in plots seldom exceeding 25 acres.

WINNOWERS.

General-purpose winnowers, with riddles for grain and seed wheat, oats, barley, beans, and peas, are sold in small quantities. A machine largely in demand has riddles 20 inches wide by 18 inches long and is constructed for hand and motor power. As a rule English machines predominate, but a few American machines are to be seen. The demand for winnowers, however, is quite small.

STEAM ENGINES.

A few steam engines are sold to operate large thrashers and shellers and for use in connection with irrigation. English manufacturers are supplying the entire demand with machines that South African merchants claim to be as efficient as and better constructed and finished than American engines, though the prices are no higher.

Since South African roads are usually very rough it is important that wheels and axles should be particularly strong. Adequate pro-

vision must also be made for the convenient cleaning of the boilers, since water supplies are generally inadequate and frequently water containing considerable sediment is used. A good many of the engines sold are furnished to burn straw as fuel. Traction steam engines are sold with the larger thrashing and shelling outfits. These are 4 and 6 N. H. P. (British), weighing 8,500 and 10,000 pounds and selling for $1,150 and $1,450. Portable vertical steam engines in the smaller sizes have been imported in the past, but apparently the coming of the gas engine has greatly interfered with their sale in recent years.

No American steam engines are sold in South Africa, and since the trade for this class of goods in any case is not very important, and it would require extreme enterprise to induce farmers to discard English engines and take up those made in the United States, the prospects for American manufacturers are not particularly encouraging.

GAS TRACTORS.

Considerable interest in tractors was observed in South Africa in the early part of 1913, when the Port Elizabeth Agricultural Society arranged and carried out a series of public trials of agricultural tractors. Chiefly as a result of the publicity given to tractors by that event about 30 of these were sold during that year. In the great majority of cases, however, when these machines were worked by farmers, instead of the factory experts who handled them at the Port Elizabeth trials, they proved too complicated and difficult to operate and keep up. The operating expenses, furthermore, proved disappointing, chiefly by reason of the price of fuel, which ordinarily costs in South Africa twice as much as in the United States. In all probability the great majority of tractors sold in South Africa in 1913 have changed hands during the past three years, and at a considerable loss to the original owners.

One of the factors chiefly responsible for the unpopularity of tractors is that as a rule the machines now in South Africa were purchased with the assistance of descriptive matter prepared for distribution in the United States. South African farmers, not being aware of the conditions prevailing in the United States, did not always take into account the fact that a tractor which would easily handle eight plows in the prairies of the Middle West would pull only four or five plows in South Africa.

It is generally believed that the 30 to 40 horsepower drawbar tractors such as were sold in South Africa in 1913 will never again be in favor. Little experience has been had with such small tractors as are now produced by many American firms. The natural factors operating against the extensive use of tractors should not be overlooked. Labor is cheap, and draft animals can be raised and kept with minimum expense and can be worked the year round, if necessary. With proper management, oxen and natives, despite their drawbacks, should enable the farmers to perform the various agricultural operations at a lower cost than with tractors. The high cost of fuel and lubricants represents one of the most serious handicaps in the latter method.

The representative of an American firm manufacturing small tractors visited South Africa in June, 1916, and reported that a

marked interest was aroused by the sample machines he took with him to that country. A number of public demonstrations were given with them, a few sales were made immediately, and several importers were induced to take up the agency for their sale. While, as a rule, South African importers of farm machinery are rather skeptical in regard to the sale of gas tractors, it is felt that a number of them could be interested if American manufacturers gave them an opportunity to see the machines in actual work. This can only be done by sending to South Africa competent representatives with sample machines. Unless this course is taken, it will be very difficult to interest South African merchants in small tractors, because of the unfortunate and unprofitable experience of those who imported the tractors sold in 1913.

American manufacturers shipping tractors to South Africa should include an extra set of spark plugs as part of their equipment. The difficulty in getting spark plugs has caused much annoyance in the past. New plugs have at times been required during demonstrations of tractors, prior to the sale, and the difficulty in this regard has certainly not assisted in the consummation of the sale.

GAS ENGINES.

The popularity that gas engines enjoy among the farmers of the United States does not as yet find a parallel in South Africa. The high cost of fuel and the lack of knowledge of their operation among South African farmers are factors which, more than anything else, retard the wider adoption of gas engines for farm work.

Nearly all farm-machinery merchants import gas engines, and a number of firms not in that trade also sell gas engines of those types largely used in farm work. The trade is largely supplied by American manufacturers, but a considerable number of higher-grade English engines are sold. In general, American gas engines are not considered to be constructed as substantially as is desired. It has often been remarked that, as a rule, they sell chiefly on account of their original low cost. Several American engines, however, are reputed to represent very good value, and importers handling these say that they are quite satisfactory for their trade. South Africa offers an excellent field for the sale of cheaply constructed goods, but in no case has a permanent trade been created for goods of that character. Only gas engines that have fully stood the test and have been found reliable, strong, and durable should be offered in that country if a lasting and profitable trade is desired.

On account of the high cost of fuel, kerosene-burning engines are preferred. The majority of the American engines that have been represented as capable of successful operation with kerosene as fuel have actually been found wanting, and have only proved a success when in the hands of very competent operators. Really successful kerosene engines will always find a ready sale in the South African market.

Hopper-cooled engines fitted with magneto are the most popular. These are used for grinding, pumping, shelling corn, sawing wood, cutting chaff and bark, running small grain separators, and other classes of farm work. The use of electric batteries should be avoided, as it is both difficult and expensive to secure satisfactory replacements

for these in South Africa. The high altitude in which the greater part of South Africa is situated should be taken into account, and any features designed to prevent the loss of power experienced when gas engines are operated in high altitudes should be incorporated in the construction of gas engines shipped to that country. Horizontal engines are almost exclusively used for farm work, and 75 per cent of those sold are sizes ranging from 1 to 4 horsepower. Except for irrigation purposes few engines larger than 8 horsepower are sold. Various estimates as to the demand for gas engines in South Africa indicate that from 350 to 600 of these are sold per annum. Semi-Diesel engines to run on crude oil are much in favor for pumping water from rivers and streams for irrigation purposes. It is said that the cost of operating crude-oil engines is only one-fourth the cost of running kerosene engines. The price of crude oil in South Africa is about one-third that of kerosene, and it is claimed that the quantity of crude oil used is much less than in the case of kerosene. Arrangements have been made to carry large stocks of crude oil in the principal trading centers of South Africa, and undoubtedly a good many crude-oil-burning engines will be sold in that country in the next few years. Ordinarily the same grades of fuel obtainable in the United States are offered in South Africa. Gasoline, however, is called "petrol" and kerosene "paraffin." The future of the gas-engine trade in South Africa hinges very largely on the cost of fuel. When this is obtainable at reasonable prices the demand will rapidly increase and reasonable efforts to introduce well-built engines selling at moderate prices would accordingly be justified.

BINDERS.

The census of 1911 gave the number of binders at that time on South African farms as 3,829. On an average, 1,000 binders are imported per annum. Fully 75 per cent of these are imported by Cape Town and Malmesbury firms. The binder is almost universally used in southwestern Cape Province for cutting wheat, oats, etc.

Except that a strongly built binder is required, there is no difference between the machines shipped to South Africa and those used in the United States. Five and six foot machines are in demand, the latter being the most popular size. Six-foot binders, weighing 1,600 pounds, sell for $225. Bundle carriers and fore-carriages are generally supplied at an extra charge.

American manufacturers have a very large share of South Africa's binder trade. Canadian manufacturers are their closest competitors, securing possibly 20 per cent of the business. English binders are not seen very often.

There is reason to expect that the demand for binders will increase in the next few years. It is evident that there is more land in South Africa suitable for wheat growing than has formerly been believed to exist. In the Orange Free State and Transvaal Provinces, where wheat growing is making rapid progress, this crop is still cut with reapers (and mowers with reaper attachments) to a very great extent. As has been shown elsewhere, South Africa is not likely ever to become a wheat-exporting country, but every effort is being made to grow that cereal in sufficiently large quantities to provide for domestic consumption.

REAPERS.

The sale of reapers in South Africa appears to have declined in recent years, giving way to the self-binder. Reapers, however, are still being sold in considerable numbers in several parts of South Africa, chiefly in the 5-foot size. One of the best known makes weighs 950 pounds and sells for $110. Almost the entire trade in reapers is supplied by American factories.

STRIPPER HARVESTERS.

A number of stripper harvesters are shipped to South Africa every year by Australian manufacturers. Five and 6 foot machines, selling for $600 and $650, are mostly sold. American machines of this type have been introduced during the past few years, and while the trade is not important, nor likely ever to become so, it seems certain that it will be largely diverted to American firms because of the advantage they have in being able to supply the other types of harvesting machinery required in South Africa.

CORN BINDERS.

During the past two or three years a number of corn binders have been sold in South Africa. Different views are expressed as to the future demand for these machines, but it is not likely that it will attain any great importance for many years to come. While the scarcity of labor is frequently in evidence, and it is doubtful whether native labor is as cheap as farmers believe, it will nevertheless be difficult to induce farmers to invest from $225 to $250 in a machine of this type.

The prevalent farming practices, largely influenced by the existing climatic conditions, operate against the extensive use of corn binders. Cornstalks, as a rule, are fed to the cattle in the field, the winters being never too severe to prevent this at any time. Among the most progressive farmers there is likely to develop a small demand for corn binders with which to cut green maize for ensilage purposes. On the whole, it does not seem that the demand for these machines is likely to become important. A few dozen machines, however, will probably be sold in South Africa every year.

CORN PICKERS.

Corn pickers are unknown in South Africa at this time, but if proper efforts were made to acquaint farmers with their advantages, it would doubtless be possible to sell some of them. In the Transvaal and Rhodesia there are dozens of farms in which from 500 to 1,000 acres of maize are grown every year. If it can be shown to their owners that corn pickers will satisfactorily harvest the crop, and that this can be done more advantageously than with native picking by hand, a number of sales would quite probably be the result.

MOWERS.

It is estimated that from 1,500 to 2,000 mowers are sold in South Africa every year. The majority of these are supplied by American

firms, but a greater proportion than is the case with binders are supplied by English and Canadian manufacturers.

In several sections of Cape Province, chiefly in the districts in which Cape Town and Port Elizabeth importers operate, a good many 3½-foot mowers are sold. In the other parts of South Africa the demand is almost entirely confined to 4½, 5, and 6 foot machines.

The mowers sold in South Africa do not differ in any respect from those used in the United States. A preference is shown, however. for strongly built machines, and this partly accounts for the business done by English firms, who find a ready market for their machines, although they ask higher prices than American makers. Vertical-lift mowers are much in favor, although there does not seen to be any special reason why that type should be preferred. It is usually a matter of opinion with the importer to sell this instead of the ordinary type. Steel pitmans are often preferred to wood pitmans. Mowers are almost invariably supplied with one extra knife, two extra guards, and six extra sections.

In the Transvaal, Orange Free State, and eastern Cape Province, there is a fairly large demand for reaper attachments for mowers. These are bought by farmers growing wheat, oats, etc., in a rather small way. Fifteen dollars is generally asked for this attachment.

On the whole, a 3½-foot mower, weighing 550 pounds, sells for $67.50, and a 4½-foot machine, weighing 700 pounds, for $80. Fore-carriages are sometimes wanted, for which $8 to $10 additional is charged.

RAKES.

The majority of rakes used in South Africa are of the American pattern. Eight, 10 and 12 foot self-dump rakes are those mostly in evidence—chiefly the 8-foot size. A heavy type of rake with teeth one-half or five-eighths inch in diameter is preferred. One of the most popular 8-foot rakes in that market weighs 400 pounds and sells for $40. The 10-foot machine weighs 475 pounds and retails for $50. Two complete rakes, less wheels, are shipped in one box. The wheels are shipped without boxing, the two wheels being simply wired together. The demand for rakes is in keeping with that for mowers.

Side-delivery rakes and tedders are very little in demand, and only one or two firms carry them in stock. Owing to the increasing extent to which alfalfa and other hay crops are grown, it is hoped that these machines, as well as sweep rakes, hay loaders, and hay stackers, will gradually find their way into a good many South African farms.

HAY PRESSES.

The demand for hay presses has increased considerably in recent years. In part this is to be attributed to the fact that, instead of the alfalfa crop being fed to the ostriches, it has been cut and sold. Lately the rearing of ostriches has proved unprofitable because of the low price paid for feathers. Since the war began, furthermore, the demand for baled hay for the imperial and colonial military forces has caused satisfactory prices to be offered for that commodity. The demand for hay presses, however, is certain to continue even after the disappearance of the conditions that stimulate this trade at present.

Many types of baling presses are to be seen in South Africa to-day, but the one and two horse machines are most likely to hold their own as the favorite types. These are supplied with jack and tie maker and chiefly with 14 by 18 inch chambers; 16 to 18 inch baling chambers, however, are also often called for. One-horse presses weighing 2,000 pounds for bales 14 by 18 inches sell at $200. Two-horse presses, weighing 2,600 pounds, for bales 16 by 18 inches, sell at $350. The few belt and motor driven baling presses sold in South Africa have usually 17 by 22 inch chambers.

Quite a number of hand-power, toggle-lever presses are sold. These retail at $50 to $60. Tobacco, forage, and wool balers, to make bales 36 by 20 by 22 inches, are also sold in limited quantities at a retail price of about $85.

CORN SHELLERS.

Almost every type of corn sheller can be purchased in South Africa, and the total trade in these machines has already become fairly important. On the whole, American makes are well represented, especially hand and small and medium size power machines. The trade in large portable combined huskers and shellers was for a long time supplied entirely by English manufacturers, but the efforts made in recent years by representatives of American firms have resulted in the creation of a good business for their medium-sized machines. The trade in the larger machines, however, still remains quite solidly in the hands of English firms. On the whole, it is believed that at least 75 per cent of the thrashers of all kinds are supplied by American factories.

American corn-sheller manufacturers would be justified in making greater efforts for the sale of their product in South Africa. Firms displaying sufficient enterprise in making their goods known and popular by means of field demonstrations, or other effective means, will undoubtedly be well compensated for their efforts. Maize growing will almost certainly undergo considerable development in South Africa in the next few years, and the demand for shellers should become an item of considerable importance.

As in the case of other American lines, the opinion is held by many South African farmers that our shellers, while excellent in every other respect, are not sufficiently strong to withstand the severe treatment that they receive in that country in consequence of the inefficient and careless labor employed in operating them. In a great many cases the strengthening of a few parts is all that would be necessary to convert a failure into a success. American manufacturers should consider this important requirement and take steps to prevent the condemnation of their machines because of a few unsatisfactory parts. It must be observed that the complaints heard in this connection were less insistent than those made in regard to other classes of American farm machinery.

Among the types in greater demand there is a small drum sheller with either 21 or 30 inch solid cylinder, with a capacity of 1,500 to 2,000 pounds per hour. Farmers favor types that are bolted instead of nailed, and suitable for both hand and belt power. This machine weighs 275 pounds and sells for $22.50. A one-hole machine with a capacity of 800 pounds per hour, weighing 150 pounds and

selling for $16.50, is also much in demand. This is equipped with feed table and shaker attachment.

The machine enjoying the greatest favor is a two-hole sheller with a capacity of 1,500 to 2,000 pounds of corn per hour. This must be adjustable for small or large ears and equipped with extra-large feed table, side-delivery spouts, extra-long shaker, grader for two different kinds, combined flywheel and pulley 10 by 4 inches, and be put together with bolts instead of nails. This machine weighs 300 pounds and sells at $30 to $35. Single bagger attachments are often supplied as extras. The most popular shellers of this class are fitted with roller bearings.

A fairly large number of huskers and shellers of the largest type are in use in South Africa. Owing to the capital outlay involved in their purchase, comparatively few farmers own machines of this type. The number of itinerant machines, however, is increasing. These travel from farm to farm, husking and shelling for a percentage of the crop, or at a fixed price per bushel, or at so much per day. These shellers are supplied almost entirely by English makers. The machine in greatest favor is equipped with a helical drum, self-feeding cob elevator, dressing and blower attachment, and grader. It is made with 42 and 60 inch drums. The small size has a capacity of 2,000 to 3,000 bushels per day of husked maize and half that quantity of unhusked crop. It weighs 6,000 pounds and sells for $800. The large machine has a capacity of 3,000 to 5,000 bushels of husked corn, weighs over 8,000 pounds and sells for $1,200. Portable steam engines, English-made, are used to operate them.

American two-hole shuck shellers weighing 2,500 pounds, with a capacity of 600 to 800 bushels of unhusked corn per day, to work at a speed of 730 to 750 revolutions of balance wheel per minute, are being sold in increasing quantities and are likely to come into great favor in the future. These sell for $400, are mounted on wheels 28 inches in diameter and of 4-inch face, and are equipped with swivel cob stacker and extension drag or folding feeder elevator.

The shellers indicated are the types most in demand in South Africa, but manufacturers who have anything to offer possessing special advantages in the sheller line should not fail to get in touch with importers of that country, as the market offers great possibilities for the sale of corn-shelling machinery.

FEED GRINDERS AND CRUSHERS.

Owing to the fact that corn meal is the natives' chief article of diet, the use of feed grinders is almost universal and a large or small grinding mill is to be found on the great majority of farms. While the making of corn meal is the principal object for which these mills are purchased, they are also used to some extent for grinding cattle feed, although this is not a practice extensively followed.

Many types and sizes of grinders are sold in South Africa, from the small size for hand operation and domestic use, selling for $8, to power-operated machines selling for $200. Mills with iron burrs are used almost exclusively. For hand operation a grinding mill quite extensively sold in South Africa has metal burrs or plates, with two cranks, heavy flywheel, and iron stand. This machine weighs 225 pounds, sells for $25, and has a capacity of 200 to 300 pounds of

fine meal per day. A combined pulley and flywheel, 10 by 3½ inches, is often supplied for motive power for this mill. Mills of this description will kibble or grind all kinds of grain and will reduce wheat, corn, coffee, etc., to any degree of fineness. The demand for mills of this type is entirely supplied by English firms.

Power corn-and-cob grinders of American manufacture have been sold in increasing quantities in recent years. These have steel frames, hoppers, and legs, and are sold in 8 and 10 inch sizes to grind, respectively, up to 2,000 pounds and 3,000 pounds of corn and cob meal per hour. These mills are capable of adjustment to produce fine meal for table use. Gas engines of from 4 to 10 horsepower are used to operate them. The grinders described retail at $67.50 and $75 and weigh 250 and 350 pounds, respectively. Elevators with double bagging attachment are supplied in some instances, increasing the price by $17.50.

Sweep corn-and-cob mills are also sold in limited quantities to grind feed for stock purposes. These are also suitable to crush oats and other kinds of grain and to produce an average quality meal for table use. They have generally a capacity of 500 pounds of corn-and-cob kibblings and 100 pounds of table meal per hour, weigh 400 pounds, and retail for $37.50.

Stone burr grinding mills for motive power, in 30 and 36 inch sizes, are also imported in small quantities.

Corn and oat crushers for stock feed are sold only in small numbers. The most popular machine of this kind has two steel grooved rollers, 2½ and 5½ inches, respectively, weighs 125 pounds, and sells for $20. Larger machines with fluted rollers 8 by 8 inches and for native power are imported by a few firms.

FARM WAGONS AND TRUCKS.

None of the farm-machinery houses of South Africa carry imported farm wagons in stock. Indent orders, however, are placed now and then on behalf of farmers who have used foreign wagons in the past. The United States is the only country supplying such goods when they are obtained from overseas. Local manufacturers now supply the demand, and, on the whole, they produce a creditable article. Wagons are often built to suit the personal wishes of the individual buyer. Since it is out of the question to hope to regain this business, because of the intention of the Government to protect the domestic industry by means of a tariff on foreign goods, it will not be necessary to describe the types in demand—the more so as the number of varieties made is enormous, and they are frequently different from anything ever produced by American manufacturers.

Very strongly built buckwagons with extra large wheels, made in 16, 17, and 18 foot lengths, for loads of 5 to 6 tons, and selling for between $300 and $500, still hold first rank as the most distinctive and most widely used South African wagons.

A directory of the coach, cart, wagon, and motor-body builders in South Africa contains 200 names. In the Transvaal the white workers employed in this industry are paid from $25 to $30 per week. In Cape Province both white and colored persons are employed, earning an average of $3 per day. The railways apply a preferential freight rate on shipments of South African wagons. A

good deal of locally grown wood is used. Stinkwood, ironwood, and other South African woods, when properly seasoned and dried, make excellent material. Hickory, ash, poplar, and other woods must be imported. The wagon manufacturers of the Union export their goods to all countries in the subcontinent of Africa.

In Rhodesia there is a good demand for steel farm trucks, which is entirely supplied by American manufacturers. Several sizes are sold, but one with a capacity of 4,000 pounds and another with a capacity of 6,000 pounds are the most popular. These are built with 36-inch front wheels, 42-inch back wheels, and tires $\frac{5}{8}$ by 5 inches. The lighter type weighs 700 pounds and sells in Rhodesia for $112; the heavier type weighs 1,000 pounds and sells for $150. The length of these trucks is adjustable. They are imported without boxes or any other carrying equipment, as this is made locally and often to special order.

There is undoubtedly a possible market in many parts of South Africa for the sale of steel trucks, but it will be difficult to develop it without earnest and special efforts by the manufacturers. Manufacturers of steel trucks should either send salesmen to South Africa or make arrangements with implement manufacturers having resident representatives in South Africa. The latter course is preferable, for the reason that it would take perhaps two years to build up a demand warranting the expenses of a man giving his entire time to this business. In either case men entrusted with this work should be fully conversant with the goods and should be given sufficient latitude to offer special inducements in order to stimulate interest among prospective importers.

The type of wagon popular in South Africa is generally heavy, for loads ranging from 4,000 to 12,000 pounds; consequently only the most substantial types of trucks should be offered. In shipping wagons to South Africa it should be remembered that such parts of steel, iron, or wood as are large and strong enough to withstand rough handling need not be boxed. Most parts of a steel truck would come under this provision. Small parts, which are liable to become lost, should always be boxed. A little forethought will easily suggest the right thing to do in this respect.

CARRIAGES.

Years ago there was an active demand for American vehicles of various descriptions, but the advent of local carriage manufacturing, assisted by a customs duty of 25 per cent, has caused a great reduction in the importation of this class of goods. Two-wheeled carts, or "Cape" carts, in particular, were imported in very large quantities, whereas but few of these are brought in at present. In past years a few high-grade carriages were also imported, but their excessive cost of importation and the advent of the motor car have operated against a continuance of the business.

It hardly seems justifiable to suggest that carriage manufacturers new to the South African trade should make any efforts to get a share of the business that is still being done. The most that can be hoped is that the manufacturers who have supplied the demand in the past, and who are conversant with the details of the business, may continue to sell a few of their goods a few years longer. The

United States supplies the bulk of the carriages at present imported, as well as a good proportion of the parts imported by local carriage manufacturers which can not as yet be procured in the country.

WINDMILLS.

In normal times windmills are imported into the Union at the rate of $350,000 worth per annum, of which $300,000 worth come from the United States. An increasing demand for windmills, proportionate with the development attained by the agricultural and pastoral industries of the country, is generally expected. In addition to the windmills used to obtain farm water supplies, a great number are sold in the smaller towns that have no public waterworks in order to pump water for household purposes.

Steel windmills with wheels 8, 10, 12, and 14 feet in diameter are sold in large numbers. There is also a small demand for 16, 18, and 20 foot windmills. Double-geared windmills are in great favor and much preferred to single-geared mills. In some sections of the country great difficulty is experienced in selling single-geared mills. Effective lubrication arrangements and high-class bearings are features that appeal to the buyers. Four-post towers ranging in size from 20 to 50 feet are in demand. Ten and 12 inches is the length of the stroke most generally supplied. For deep wells 14 and 16 inch strokes are offered. Ranch towers with 7 to 9 foot bases are sold in rather small quantities.

The Bechuanaland Protectorate is expected to offer an important market for the sale of windmills within the next few years, since it has been lately ascertained that large underground water supplies are to be found there and that many sections of that country are suitable for pastoral operations.

East London is one of the most important centers for the sale of windmills. The territory the merchants of that city cover is closely setttled, and an abundance of underground water exists almost everywhere. The strip of land in Cape Province lying west of Orange Free State and extending to the Rhodesian border, including the cities of Mafeking, Kimberley, and Vryburg, depends almost entirely on windmills for farm and household water supplies.

In computing various estimates it is found that about 50 per cent of the windmills sold in South Africa are 10-foot, 25 per cent 12-foot, 15 per cent 8-foot, 5 per cent 14-foot, and 5 per cent 16-foot. Thirty-foot towers appear to be the size most in demand.

American manufacturers have little competition to contend with. An English firm sells a fair number of windmills, chiefly as a result of the excellent selling organization it has in South Africa. This firm maintains branches in all important cities, being especially engaged in the sale of piping and irrigation supplies. A Cape Town firm manufactures windmills, but its output is not believed to be large. American windmills enjoy the reputation of being extremely efficient and obtainable at reasonable prices.

PUMPS.

There is such a diversity of pumps in South Africa that it is difficult to indicate the types most extensively in demand. What would apply to one section of the country would not apply to others.

Practically all types of pumps are to be found in South Africa, and American manufacturers supply almost the entire demand for pumps for farm purposes. More than 75 per cent of the boreholes and wells of South Africa lie within 20 feet of the surface.

SPRAYING MACHINERY.

Very few up-to-date spraying outfits are used in South Africa. Since fruit growing is extensively carried on in the southwestern districts of Cape Province and apple and orange cultivation is likely to make greater progress in the Transvaal and other parts of the country in the next few years there appears to be an opportunity to introduce spraying machinery. As a general rule importers now carry in stock only a small bucket and barrel spraying pump.

Locusts have been a pest in different sections of South Africa from time to time, and the Government has purchased upward of 10,000 small spraying pumps, which have been loaned to farmers in the infested districts. It is felt that South Africa affords some good possibilities for the sale of small spraying outfits, and that a number of contractors' sprayers could also be placed if proper efforts were made.

SILOS AND ENSILAGE CUTTERS.

Silos are gaining in popularity, and they can already be seen on a great many South African farms. While up-to-date and pretentious structures are observed from time to time, the majority of silos are of the pit type. The better class of silos are generally made of concrete or cement. Wood silos are hardly likely to prove satisfactory owing to the great daily range of temperature in the districts where they would be erected. One can hardly expect to develop a demand for imported wood silos in South Africa, for these could advantageously be produced locally if a demand for them should arise.

The demand for ensilage cutters is rapidly increasing. Hand feed and ensilage cutters of the cylinder type are extensively sold. One of the most popular machines on the market, with two 8½-inch knives, weighs 175 pounds and retails for $22.50. In the 11-inch size, with two knives, it weighs 450 pounds and sells for $50. There is also a large sale for cutters of the same type with two or four 11-inch knives for motor power. The demand is mostly for machines equipped with plain tables, but there is also a large sale for machines with self-feed tables and blower attachment. The trade in cylinder ensilage cutters is entirely in the hands of American manufacturers. An American manufacturer has established such an enviable reputation for his ensilage cutters that nearly every merchant in South Africa imports them without insisting upon exclusive selling rights for a prescribed area.

Few ensilage cutters of the flywheel type are sold in South Africa, but those sold are nearly always made in England.

A great deal of difficulty was experienced in the past in selling small hand cutters for one-man operation. The natives had a strong dislike for them. They often willfully broke parts of the machines with a view of making the owner form an unfavorable opinion of

them, so that he would buy a different type of machine when again in the market.

Ensilage cutters are assured a permanent place among the indispensable machines for the South African farm, and the outlook for a steadily increasing demand is very satisfactory.

CHAFF CUTTERS.

Almost invariably the chaff cutters sold in South Africa are of the flywheel type (see fig. 6), and the demand is almost entirely supplied by English manufacturers. Small machines predominate. Chaff cutters weighing 180 pounds and selling for $18.50 and larger machines weighing 325 pounds and selling for $32.50 are mostly in demand. A few large machines for custom and mill work, equipped with automatic feeder and elevator, are sold. Chaff cutters suitable also for cutting prickly pear and wattle bark are popular in certain districts. There is a small demand for root cutters and slicers and, in Oudtshoorn, for alfalfa cutters. As a rule all chaff cutters are equipped with two knives and have cast-iron legs.

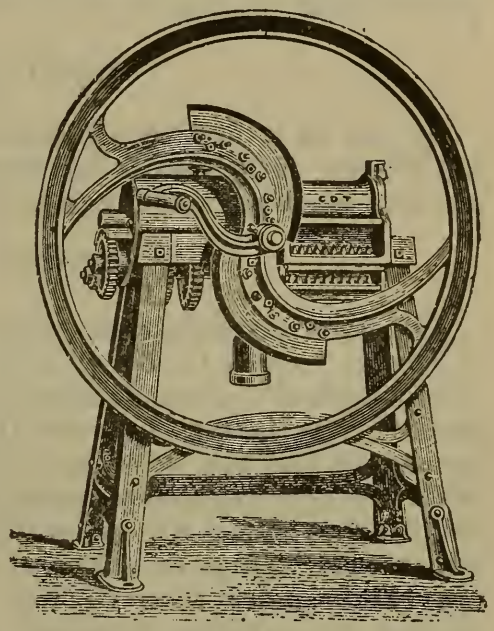

FIG. 6.—Chaff cutter, fly-wheel type, made in England.

It is difficult to account for the small number of American chaff cutters to be seen in South Africa. The impression is gained that thus far American manufacturers have not made suitable efforts to obtain a share of that business. A good deal of effort and interest will be required to enter the market. The trade has long been accustomed to the English-made article, and unless a better article is offered or the prices are more advantageous it will be difficult to overcome the preference for English machines.

CREAM SEPARATORS.

The value of the articles imported into South Africa under the heading of "dairy appliances" is about $225.000 per annum. The bulk of this is composed of cream separators. Sweden supplies nearly three-fourths of these. In normal times Germany, Belgium, and England supply the remainder. Less than $10,000 per annum is contributed by American firms. The ability of the Swedish manufacturers to offer an efficient article at a moderate price is, in the main, responsible for the good business they enjoy. An American firm, through its capable South African representative, has lately made some efforts to create a demand for its cream separators in that country. It is believed that these efforts will prove successful. It may be hoped that our share of the South African cream-separator trade will gradually become greater.

There are a great many makes of cream separators in the South African market. The demand is about equally divided between machines selling on price rather than on quality and those selling because of their good workmanship and efficient operation. The sizes sold range from 12 to 90 gallons capacity, selling for from $22.50 to $150. Twenty-five to 40 gallon separators are those most widely sold.

DAIRY-BARN EQUIPMENT.

Owing to the favorable climatic conditions, which make it unnecessary to provide winter shelter for live stock, the demand for barn equipment is almost nil. Imported barn equipment has been purchased only in a few cases, by wealthy farmers, more to make a show place of their dairies than for any other reason.

MILKING MACHINES.

So far as it has been possible to ascertain, no importer of farm machinery carries milking machines in stock. Very few, if any, of these machines have been sold in South Africa so far.

FENCING AND GATES.

The most common type of cattle and sheep fencing seen in South Africa is from 4 to 5 feet high and consists of 4, 5, or 6 strands of wire attached to iron standards and straining posts, with iron droppers or wire lacings between the standards in some instances. The top or the two top wires are of barbed wire, and the others of plain wire. Where high-class ostriches for breeding purposes are kept in small fields fences are generally 6 feet high and are interlaced with either wire lacings or pieces of brush. Fences for large ostrich runs are rarely more than 2½ feet high. To protect cultivated fields against the ravages of jackals wire netting with 1½ or 2 inch mesh of 19-gauge wire is sometimes used, in addition to the regular fencing. This is imported in rolls 50 yards long and 24, 30, 36, and 48 inches (sometimes 6 feet) wide. A similar kind of netting is used for fields where poultry is kept. There is very little demand for woven wire fencing, and few firms carry this material in stock.

South African gates are generally 15 feet wide. The demand for gates is quite extensive. In all Provinces of the Union, except Natal, the main roads are intersected by fence gates so as to avoid the expense of fencing alongside them. Nearly all farm gates are manufactured locally, and it is doubtful whether foreign manufacturers could compete with those of the Union.

MANURE SPREADERS.

The demand for spreaders is insignificant, and only one or two importers carry machines of this kind in stock. Probably less than 25 spreaders have been sold in South Africa thus far. The cheapness of native labor and the fact that no stable manure in quantities is produced, since the cattle run loose in the fields day and night the year round, account for the small demand. The high cost of artificial fertilizers, on the other hand, is likely to induce farmers to adopt

methods conducive to the production and utilization of cattle and stable manure, especially whenever intensive methods of farming are adopted.

The districts near Cape Town, on account of the somewhat colder climate, offer better prospects for the sale of spreaders than any other section of South Africa. A growing number of farmers build shelters for their cattle to protect the animals against the cold winter winds. These shelters, however, are limited to stacks of straw in the paddocks, near the farmhouses, in the shape of a broad U. In the best dairy districts, where high-class dairying and pedigreed stock is kept, suitable buildings have, in a few cases, been erected. As this practice increases the possibility of selling a few spreaders in South Africa will become greater.

V. TRADE METHODS AND SUGGESTIONS.

The distribution or sale of farm implements and machinery in South Africa, generally speaking, is carried out on lines similar to those followed in the United States. The importers, so far as they can, sell to the country dealers on some mutually agreed terms of sale, giving them ordinarily a discount of 15 per cent from the net catalogue prices, for invoices to be paid in three or four months, as may be agreed upon. A 5 per cent extra is allowed when they pay cash in 30 days. When goods are sold through dealers, importers often reserve the right to sell directly to farmers in their territory, but in general, when this is done, a commission on such sales is paid to the dealer. While implement dealers are found in the principal agricultural sections of South Africa, importers often find it necessary to sell directly to farmers.

Farmers in South Africa usually take a good deal of time to pay for their purchases of farm machinery, but on the whole the situation there is at least as satisfactory as in the United States.

South African importers of farm machinery deserve commendation for the satisfactory manner in which the business is conducted, the more so when one considers the difficulties they are often called upon to meet. The South African firms in this trade are well managed and quick to respond and cooperate in the carrying out of any trade-promotion undertakings. The most practicable way for American manufacturers to do business in South Africa is to deal with them. The trade is not yet large enough, and the number of implement dealers is altogether too small, to justify any other means of selling farm machinery in South Africa.

It is generally assumed that three or four importers do from 75 to 80 per cent of the business in farm machinery. Besides these, however, there are a number of firms doing a limited trade. Conditions are such that the smaller importer may easily grow in importance when supplied with the right kind of goods and given the proper backing by manufacturers. The unsuitability of the lines they handle is the chief handicap operating against their expansion. There is no room in South Africa at present for any more importers nor, it may be said, for American manufacturers new in that business, unless they intend to give very particular attention to the requirements of the country. Those who decide to do so, however, will find that South Africa offers a relatively attractive and profitable business field.

CATALOGUES AND CORRESPONDENCE.

It is important to take into account that the South African firms interested in the importation of agricultural machinery and implements are generally of high standing and figure among the largest

concerns doing business in the country, even though their business in implements may be small. They are always to be considered in the class of jobbers and not in that of retail dealers. It is evident, therefore, that in soliciting the patronage of such firms strictly high-class business methods should be employed.

American manufacturers who are new in the South African trade may use catalogues and correspondence to advantage to ascertain the possibility of interesting importers in their goods. Catalogues in English will serve for this purpose. To be fully effective, they should contain straightforward descriptions and clear illustrations of the machines. Specifications of the principal parts, indicating the materials of which they are made, the sizes in which they can be furnished, and net weights, should also be given. Cubic measurements, the gross weights of the machines boxed for ocean transportation, and the number of machines packed in each box are very essential details. It will be advantageous to include in the catalogue or price list code words for cabling purposes, for each type and size of machine. Prices f. o. b. steamer New York should either be set forth in the catalogue or given separately. It is most important that the catalogue and price list contain all necessary information, so that the importer may not be deterred from ordering by reason of the absence of some essential data. It will be found advisable to write a letter, by the same mail in which the catalogues are forwarded, giving all necessary information of a confidential nature, such as discounts, terms of sale and payments, etc.

In writing follow-up letters, after the catalogues have been sent, sufficient time should be allowed to give the importer an opportunity to acknowledge receipt of the previous letter. In normal times, 90 days should be reckoned as necessary to obtain a reply from South Africa. The character of the firms to which follow-up letters are addressed should not be ignored. The sensational type of follow-up letter, even if it has often proved successful with farmers and small dealers in this country, is not likely to be the best to write to South African importers. As a rule the concise, courteous, well-constructed, and convincing business letter that one up-to-date business man sends to another will prove most effective. It is difficult to account for the fact, but it is nevertheless true that many persons in South Africa are inclined to believe that some American firms make extravagant and exaggerated claims in offering their goods. The best way to overcome this impression is to adopt a straightforward style of business English, with letters and catalogues containing all the essential information that the recipient must have to consider intelligently the proposition embodied therein.

It has often been found that price lists and catalogues did not correspond with each other, and as a consequence the foreign buyer has had a good deal of difficulty in finding out the price of machines in which he was interested. The question has often been asked why prices can not be given in the catalogue itself, instead of issuing separate price lists, the more so as it is customary in the implement trade to cover all prices with discounts ranging from 20 to 50 per cent. While there may be some argument against doing this in the domestic trade, the fact that the importer resides many thousand miles away from the manufacturers, and that he handles

implements as a side line, should suggest the advisability of sending catalogues with the prices printed in them. The more easily he can obtain the information he requires the greater his interest in the business will be. Whenever a catalogue makes any reference to attachments with which a machine can be equipped their prices also should be clearly given, as well as net and gross weights and cubic measurements.

It is not recommended, as a means of creating a demand in South Africa, that manufacturers should send catalogues or circulars direct to farmers. The only satisfactory way for American manufacturers of implements to sell their goods in that country at this time is to take advantage of the selling organization possessed by importers and merchants. Even if some sales were made as a result of sending catalogues and letters direct to farmers, an all-around satisfactory business could not be created, because of the difficulties that the purchasers would experience in obtaining repair parts and competent advice whenever anything went wrong with the machines.

The manufacturer must always realize that no matter how popular and favorably known his goods and his firm may be in the United States, in most cases this will not be true in South Africa. In his correspondence and catalogues, therefore, he should avoid taking anything for granted. The more detailed information he gives, tending to prove the good points in his line, and the less he says in an abstract way (such as unsupported statements that his goods are the best made in the world) the greater the effectiveness of his printed matter.

SALESMEN.

The use of catalogues and correspondence is by no means recommended as the most effective way to sell goods in South Africa. The best procedure for a manufacturer, whenever he produces suitable goods, is to send a capable representative to that country. Before doing so, however, he will be well advised to undertake a careful campaign, with the aid of correspondence and catalogues, to make the South African importers well acquainted with his name and his goods. In this connection every effort should be made to ascertain what interest his goods have created. This will assist the representative very greatly when he personally calls on the trade.

The time is past when the only equipment of an implement salesman endeavoring to get business in South Africa consisted of a catalogue describing and illustrating the goods he was selling. South African importers will require to inspect a sample machine before giving an order of importance. From a trade-building viewpoint, when an agency is established solely with the aid of catalogues the salesman is at a great disadvantage as compared with the salesman working with sample machines. In the latter case, the salesman has an opportunity to point out fully and effectively the advantages of his line, and this knowledge will enable the importer thenceforth to offer the goods to his trade in the most practical and persuasive way. When the salesman is not in a position to describe the features of his goods to the importer with a sample machine before him, either in the office or in the field, the importer will have to become conversant with the selling features of the goods as best he may when the implements are received, without the

assistance of the factory salesman to indicate the particular points of superiority and advantage that the goods may have. To provide the salesman with sample machines will inspire the importer with the belief that the manufacturer has complete faith in the goods; otherwise he would not incur the expense that this involves. In a great many instances this belief will be conducive to the success of the sale.

Manufacturers who have already shipped goods to South Africa, but desire to increase their business by sending a representative to that country, need not, ordinarily, provide him with samples, since it should be quite expedient for him to obtain one of his machines there in case of necessity. It is obvious that samples of an entire line need not necessarily be carried. What is required is several representative machines, showing general quality and workmanship.

In addition to sufficient ability and experience to consummate a deal, including the securing of the order and the drafting of a contract stipulating the basis upon which an agency is established, the salesman should possess the necessary knowledge to thoroughly instruct the buyers, and those persons in their staff who will have to do with the sale of his goods, concerning the construction, operation, adjustments, and selling features of the machines sold. The number of houses in South Africa exclusively devoted to the sale of farm machinery may possibly be counted on the fingers of one hand. A larger number of firms handle many other lines besides implements, although they maintain a separate department for their sale. In a good many cases, however, no pretense is made of having, either at headquarters or among the field sales force, men who know very much regarding farm machinery in particular. It is evident, therefore, that the manufacturer who desires to build up properly a profitable and increasing business will find it to his advantage to cooperate with his agents in South Africa by giving them all possible assistance in the effective and aggressive selling of their goods. The manufacturer's representative on the ground is the person best qualified to do this work. As frequently as possible he should give field demonstrations, so that his agents' salesmen and dealers may become conversant with the merits of the machines as brought out by actual operation. Nothing has ever stimulated so much the demand for implements as the field demonstrations given by representatives of American and Canadian firms when implements were first beginning to be sold in South Africa.

The remark has often been heard that the salesman who will take his coat off to show how an implement works loses the respect of the trade as a business man. The writer ventures to assert that the contrary will be true in almost every case.

The success or failure of any manufacturer attempting to create a market for his goods in South Africa hinges chiefly on the character of the representative he sends to sell his goods and otherwise to foster a demand for them. The first essential is that he should enjoy the full confidence of his principals and have full authority to agree to make such changes as may be indispensable in the adaptation of the goods to the requirements of the trade. Confidence in the salesman's good judgment in this respect should be such that whatever recommendations he makes will be strictly adhered to. A salesman

should be endowed with an agreeable personality, a dignified bearing, and the ability to discuss matters with the heads of large firms. He should be aggressive and enthusiastic, as a great deal depends on his arousing the interest of the chiefs and staff of the firms that he may visit. He should also be prepared to meet in a social way those with whom he transacts business. As a rule, social contact and intercourse is far more important in the transaction of business in South Africa than it is in the United States. No man should be selected as a representative in South Africa whose employer does not consider it a pleasure to entertain him at his own home. A salesman operating in South Africa must also be aware that business is not transacted there as rapidly as in the United States. A certain amount of acquaintance is necessary before business will be seriously considered.

When representatives have succeeded in placing their goods with a large firm having several branches, they should call at these branches and spend an adequate amount of time establishing ties of friendship and acquaintance with their managers, informing these, at the same time, of the selling features and working advantages of the goods. This thoughtfulness on the part of the representative will often be highly appreciated, and not only will much good will be created but the interest of the branch and its manager in the sale of the line will be greatly stimulated.

The private and personal expenses of a salesman operating in South Africa will be a great deal higher than in the United States. The chief reason for this is that all articles which he will require to purchase from time to time have to be imported from overseas. This fact should be taken into account when arranging the matter of salary. Consideration should also be given to the fact that the salesman sent to South Africa will feel (at least after a while) that he is denying himself a good many of the comforts and advantages, making for personal contentment, that he enjoyed in his own country. It is difficult to suggest on what basis the question of salary should be adjusted, but the advisability of properly compensating the salesman will be readily apparent.

EXPENSE ALLOWANCES.

Traveling expenses in South Africa, in themselves, are not greater than those incurred when visiting the larger cities of the United States. On the other hand, outfitting of all kinds, laundry work and pressing of clothing, comforts and amusements, and the expenses involved in any sort of social entertainment (which occur very frequently when a man is temporarily living in South Africa and residing at hotels or clubs), form, in the aggregate, an expense of considerable importance. In addition to hotel charges and gratuities, the representative of an American firm should be given reasonable latitude to move about without the feeling that, in addition to traveling in a country that lacks the comforts of his home and the attractions of a highly developed country like the United States, he will complete his work at a greater expense to himself than if he had operated in the United States. Ordinarily an allowance averaging about $2.50 per day should be granted for petty and incidental expenses, with

authority to exceed this allowance when necessary in the best interest of the business.

The hotels in South Africa are fairly satisfactory and are improving from year to year. In the larger cities they are quite comfortable. If the small towns are visited, the traveler will often be compelled to put up with less modern accommodations. In the larger cities the hotel rates vary from $4 to $5 per day, American plan, to which a suitable sum for gratuities must be added.

TENTATIVE ROUTES.

Assuming that representatives of American firms visiting South Africa will enter the country via Cape Town, the following cities can be visited in the order given: Cape Town, Mossel Bay, Oudtshoorn, Port Elizabeth, East London, and Durban. All these cities can be reached from Cape Town by rail without making any great detours, and by steamer as well. From Durban the traveler can proceed by rail to Pietermaritzburg, Bloemfontein, Johannesburg, and Pretoria. There are a few other cities in the Union that in some cases a salesman will find it to his advantage to visit. Most important among these are Malmesbury, reached by rail from Cape Town; Grahamstown, reached by rail from Port Elizabeth; Queenstown and King Williams Town, reached by rail from East London; Kimberley,[1] reached by rail from Bloemfontein.

The demand for farm machinery in Rhodesia has not so far become important enough to justify the inclusion of that country in the regular route of a farm-machinery salesman. It is rather suggested that before or immediately after a salesman arrives at Cape Town he should write the importers and merchants of Rhodesia with a view to ascertaining what chances there may be for him to do business. If it is decided to visit Rhodesia, the best plan is to go from Johannesburg to Bulawayo by rail and thence to Salisbury. When this is done the return trip can be advantageously made via Beira and Lourenço Marques. It is suggested that, so far as possible, the cities situated on the east coast of South Africa be visited during the winter (April to September), as Durban, Lourenço Marques, and Beira are very hot during the summer.

From six to eight months should be reckoned as the amount of time necessary to cover South Africa properly, although, naturally, a great deal depends on the particular lines handled and the class of connections desired.

The selling of goods in South Africa invariably involves the establishment of agencies. The utmost care should be exercised in deciding what agency territories should be given to the firms from which orders have been secured. There are several importers in South Africa who have very extensive connections throughout the country, and it might prove difficult to interest these concerns in a line when the representative has given to another firm the agency for some section of the country that they themselves can properly cover. Several representatives of American firms have found it very difficult to make definite arrangements concerning agencies and terri-

[1] Ordinarily only the traveler selling windmills and gas engines should include Kimberley in his regular route.

tories the first time they visited the cities in which importers of this class of goods are located. They have found it advantageous to pay a second visit to the principal South African cities—after the country had been once thoroughly covered and a full grasp of the situation obtained—for the purpose of definitely arranging the question of territory to be granted to each agent.

DIRECT AND CONTINUOUS REPRESENTATION.

Owing to the fact that few firms in South Africa specialize in the sale of farm machinery to anything like the extent that prevails in the United States, the most desirable way for a manufacturer to create a satisfactory and profitable trade for his goods, and to insure its maximum development, is to maintain direct and continuous representation in that country.

This plan, however, has the disadvantage of being too expensive for the average manufacturer. There are perhaps only six or eight firms in the United States that would be justified in being so represented. To overcome this difficulty, manufacturers of noncompetitive lines could combine for the purpose of sending a man to South Africa to represent them, collectively, on the basis suggested.

There are several persons in South Africa in a position to represent farm-machinery manufacturers on a commission basis. Such men, however, with few exceptions, have now all the representations that they can or care to handle. The question as to what commission they should be paid has often caused much misunderstanding. After a careful consideration of all factors involved, it is felt that a commission lower than 10 per cent on the net invoice value of the goods, f. o. b. New York, would be inadequate. The trade is not sufficiently large, the demand for particular lines not great enough, and the expense of operating in South Africa too high to justify a capable man in working for a smaller remuneration.

The futility of sending a representative to South Africa every two or three years for four or six months has been frequently proved. There are a number of manufacturers in the United States whose experience will cause them to agree to the truth of this statement. Several cases are known in which salesmen made visits to South Africa and obtained orders from importers; the machines thus sold arrived in due course after the salesmen had left the country, but some little difficulty experienced by the importer in having the machines properly erected, or in stating what they could do, or in overcoming some unimportant trouble in working them, so discouraged him that he took but little further interest in creating a demand for them. Resident representatives have proved so efficacious in preventing such occurrences that their presence has greatly impaired the success of manufacturers who only send representatives to South Africa on periodical visits.

Besides being better able to sell his goods to the importers, a resident representative can do much toward their sale and distribution among dealers and farmers. He can assist in a great many other ways. He can join his agent's salesmen in trips throughout the country, visiting the larger dealers. This will serve two purposes—to educate the salesman as to the most effective means of selling the goods and to gratify the dealer called upon by making him

feel that his business is considered of enough importance to warrant a visit by a representative of the manufacturer. With the cooperation of a resident representative the importer will easily be encouraged to undertake energetic sales campaigns and to demonstrate the goods in suitable farming centers. Most important of all, however, is the fact that the importer is able quickly to communicate any difficulties to some one who is able to advise him or to rectify such difficulties without the delay that is involved when such matters are taken up by correspondence with the manufacturer abroad. The fact that the trade in this class of goods has not yet reached very great proportions in South Africa makes it much more desirable to assist the importer in this way than if the demand for farm machinery were larger and better established.

One of the anomalies of the implement business in South Africa heretofore has been that importers have changed their lines very often. In a great majority of cases, if the manufacturer had had a representative on the ground, this would not have happened, and the resulting dissatisfaction would have been avoided. Such occurrences cause at times important losses to those concerned. The importer in such instances often finds himself with a stock of machines and repairs that must be sold quickly, and consequently at a disadvantage, if a new agency is immediately taken up. The manufacturer, on his part, has to wait until he can send a representative to the country before his goods will again be sold there. It is difficult to account for this frequent changing of agencies, but every effort should be made to remove the conditions that cause them, because this tendency to a great extent has discouraged interest and effort in connection with the sale of agricultural implements. If trade conditions in general can be put on a better plan, the demand, on this account alone, will be greatly enhanced. When an importer feels that he is going to handle a line permanently, and that he has the support of a resident representative, he will assuredly undertake the work with greater faith and interest than if the reverse is the case.

Since the eastern sections of the Union of South Africa are considered the most promising and the richest from an agricultural standpoint, it is suggested that Durban be selected as the headquarters of the resident representative of American firms. The principal farm-machinery distributing centers of South Africa can be reached more easily from Durban than from any other South African city.

AGENCIES.

In South Africa an agent is generally understood to be a person or firm buying goods on own account, but allowed exclusive selling rights for a given territory. There are several firms in that country to which the agency for fairly large portions of the country could properly be given. The number and character of the branch houses operated by a firm desiring a large territory should give the manufacturer an idea of the territory the importer could adequately handle.

For trade purposes South Africa can be divided into the following territories: First, Cape Town, including the southwestern part of Cape Province; second, Mossell Bay and Oudtshoorn; third, Port Elizabeth; fourth, East London; fifth, Durban; sixth, Lourenço Marques and eastern Transvaal; seventh, Johannesburg; eighth, Bloem-

fontein; ninth, Kimberley; tenth, Bulawayo; eleventh, Salisbury; twelfth, Beira. The demarcation of the territories properly belonging to these different trade centers has become quite well established in recent years. Railway communications and rates of freight between various points have been largely instrumental in bringing this about. Representatives will generally find little encroachment, on the part of South African firms, into each other's territory.

BRANCH HOUSES.

The trade in agricultural machinery and implements in South Africa is not now of sufficient importance, nor likely to become so in the next few years, to justify the establishment by American firms of their own branches.

Where it is desired to maintain a resident representative in that country and to provide him with a suitable office and a competent stenographer, a monthly expenditure of approximately $50 for the former item and $75 for the latter will be necessary, in addition to about $25 for postage, telegrams, etc. It might not be necessary, in all cases, for a resident representative to maintain an office in South Africa—the more so since one of the chief reasons for keeping him there continuously is that he may be in close touch with his agents at all times, a condition that can only be brought about by visiting them at least three times in the course of a year. When a large business is transacted, however, it may be advisable to maintain an office and a stenographer so that the manufacturer's agents may be assured of constant and quick communication with his representative.

POSTAGE TO SOUTH AFRICA.

Particular care should be taken to prevent the sending of mail matter to South Africa with insufficient postage. This matter has repeatedly been brought to the attention of manufacturers, but apparently a good many of them have not yet taken adequate steps to remedy the condition. Postage on first-class matter is 5 cents for the first ounce and 3 cents for every additional ounce. Complaints in this connection were heard from several sources in the course of the writer's investigation, and he personally received a number of improperly stamped letters from American firms while he was in South Africa. That room for improvement exists is evidenced by the fact that a short time ago the Cape Town Chamber of Commerce passed a resolution suggesting that its members mention this matter to American manufacturers when corresponding with them.

PACKING.

It is gratifying to report that in the majority of instances South African importers expressed their satisfaction with the way farm machinery is packed by American manufacturers. Complaints were heard only in a few cases, to the effect that the cubic measurement of the boxes had not been sufficiently reduced. A shipment of gas-engine trucks, which had been completely boxed, was reported in this connection. This complaint was fully justified, for such parts as solid steel wheels and I beams, as used in trucks of this character, are

large and strong enough to be shipped without any boxing whatever. The front wheels of these trucks, furthermore, were packed in a box with the rear wheels. Since the former are of much smaller diameter, it follows that a great deal of unused space remained in the box, for which freight had to be paid. Common sense needs to be exercised by manufacturers in packing goods of this character. When a machine has large and strong parts, such as enter into the construction of a truck, these should not be packed at all, for it is obvious that only in exceptional circumstances can such goods be damaged in transit. By sending such parts without boxing a good saving is effected. The cost of the lumber and labor of packing is eliminated, and the cubic measurement of the shipment is greatly reduced.

In the packing of farm machines for export, which involves knocking them down as much as possible, every precaution should be taken to insure that they will be properly put together when received. When it is felt that some difficulty is likely to occur, numbers or other marks should be stenciled so as to indicate where certain parts belong. Lines should also be stenciled across two or more parts when it is important that such parts be finely lined up. If more than one machine is packed in a box, and it is advisable, for some reason, to build up the machines again without mixing the parts of one machine with another, the parts of each machine should be uniformly numbered or marked.

It is very important for manufacturers to follow without deviation the instructions given by importers regarding the outside marking of the cases. It must be remembered that native labor only is used in unloading ships in South Africa. The natives are almost invariably unable to read or write, so they depend on the particular shape and make-up of the shipping mark to ascertain the consignee and destination of the goods unloaded.

INSTRUCTIONS FOR SETTING UP AND OPERATING IMPLEMENTS.

Instructions for setting up and operating implements should always be supplied with every machine. It is important that they contain adequate illustrations to insure proper setting up, satisfactory operation, and the intelligent making of all adjustments of which the machines are susceptible. The manufacturers should feel that if their agents in South Africa indicate the necessity of instructions in the Dutch language it is their duty to supply them. As the trade develops it may be to the interest of all concerned to supply such instructions in both English and Dutch. This may easily prove a stimulus toward the more extensive use of farm machinery. Much machinery has gone to the scrap pile in South Africa because of the lack or unsuitability of instructions for setting up, operating, and adjusting farm machines shipped to that country.

REPAIR-PART LISTS.

Repair-part lists should be included, without prices, with every machine. It is most important that clear illustrations of every part should accompany the written description thereof. The illustrations should show numbers to correspond with the actual numbers on the

parts themselves. South African importers are strongly in favor of separate pamphlets containing prices and illustrations of one machine only, instead of the voluminous books published by American manufacturers containing the repair parts for all the machines they produce. If clear illustrations of each different part are given in the price list it may often be unnecessary to have the price list printed in both Dutch and English. An understanding on this point, however, should be had between the manufacturer and the importer.

The question of repair parts should be given very careful attention by the manufacturer. He should see to it that his agents in South Africa are always provided with an ample supply of such parts as are liable to be required by reason of possible breakages or wear. An adequate supply of repair parts should always be shipped with the first lot of machines going to that country. As subsequent orders are received, and in the event that the machines should in any way be changed, the manufacturer should make certain that a suitable number of duplicate parts, new in that machine, are shipped as extras.

A practice largely followed in South Africa lately, with a view to lessening the burden on the importer in the introduction of a new line of goods, is for the manufacturer to supply on consignment the first lot of repair parts shipped. The most popular arrangement is to pay for all parts sold from that consignment at the end of each yearly quarter. Such parts as remain unsold 12 or 18 months or two years, as may be agreed upon, are paid for in full at that time.

It has been remarked by several South African importers that American manufacturers charge exorbitant prices for repair parts. They claim that the manufacturers fail to take into account, especially when the goods are paid for cash f. o. b. New York, that foreign orders for repairs are generally fairly important and paid for without delay. Under these circumstances they feel that it is not fair that they should pay the same prices as charged the retail dealer in the United States, where the repairs are generally sold in very small quantities and paid for, as a general rule, at the end of the season.

A good deal of criticism was heard to the effect that American manufacturers change the parts of their machines too often. While importers appreciate that these changes generally indicate an improvement in construction, some parts have been changed so frequently that it is felt that the manufacturers sometimes ship machines to the foreign trade with castings and parts still in the experimental stage. This should be avoided for many reasons. The less often parts are changed, the better.

INVOICING.

All invoices for goods shipped to South Africa should be accompanied by a packing list clearly indicating the contents of every box separately. All items in the invoice should correspond with those in the packing list in such a manner that when the goods are received it will be easy to know whether all goods invoiced are included in the shipment and the number of cases containing them. Owing to the fact that no duty is paid on the railway freight from factory to port of ocean shipment, nor on the value of the boxes, it is important that

a statement be made on the face of the invoice as to the amount paid for freight from factory to seaport and the cost of material and labor in packing the goods. All invoices covering goods shipped to South Africa should contain a signed statement like the following (this has been accepted as correct by the South African customs authorities):

This invoice is true and correct, and the prices shown thereon are equal to or slightly in excess of prices governing for similar goods sold in like quantities in the United States of America.

SHIPPING.

The bulk of the implements exported by American manufacturers to South Africa are shipped through New York commission and export houses. The latter are fully competent to ship the goods properly. In some instances, however, shipments are made direct by the manufacturer to the importer, often by means of a New York shipping agency. South African importers complain that when this is the case a lack of attention on the part of the manufacturers is often noticeable. They claim that in most cases the manufacturers seem to feel that their responsibility in connection with the goods ceases when they have left the factory. It is evident that, to insure lasting and satisfactory connections, the manufacturer should have the interest of his customer as much at heart as his own. Consequently it is felt that it is his duty and to his advantage to make every effort to have his shipments for South African firms forwarded from New York by the most expeditious and economical means possible.

CUSTOMS DUTIES.

British South Africa, which includes the Union of South Africa and Rhodesia, has a uniform customs tariff. Farm machinery and implements of all kinds pay a duty of 3 per cent ad valorem. Carriages, carts, and wagons, and finished parts thereof pay a duty of 25 per cent ad valorem. Parts of carriages, wagons, etc., not made in South Africa, pay a duty of 3 per cent. A rebate of 3 per cent is granted to goods manufactured in the United Kingdom and reciprocating British colonies.

In Portuguese East Africa 1 per cent duty ad valorem is paid on farm machinery imported into the districts of Lourenço Marques, Inhambane, and Mozambique. No duty is paid on those imported into the districts of Quelimane and Tete. Free entry is given to farm machinery imported into the Mozambique Company's territory.

Care should be exercised in invoicing all classes of agricultural implements and machinery for South Africa, to make it as clear as possible that they are machines for agricultural work. A Cape Town importer recently had some difficulty in passing through the customs a shipment of gas-engine trucks from the United States at the rate of duty of 3 per cent, which such goods were supposed to pay, because the manner in which the invoice was written made it possible to consider such goods as in the class of carriages, wagons, etc., which pay a duty of 25 per cent. As a rule, however, South Africa's customs authorities create no difficulties in properly adjusting cases of this kind.

Catalogues, price lists, and similar printed matter, when addressed to importers, merchants, manufacturers, public libraries, and similar institutions, enter the country free of duty. Twenty-five per cent or 3d. (6 cents) per pound, whichever is greater, is chargeable as duty on printed matter when mailed direct to farmers or persons not in the categories above indicated. When a large supply of one kind of such printed matter is shipped to any one in South Africa 25 per cent duty is assessed.

METHODS OF PAYMENT.

Heretofore American manufacturers have, as a rule, been paid for their shipments to firms in South Africa through commission houses or banks in New York. In a few cases payment has been effected by means of a sight draft with ocean bill of lading attached, drawn on the London office, or the agents there, of South African firms. In others, payment has been made by sight draft, with bill of lading attached, on the importer himself. Implements have also been shipped by American manufacturers, in a few instances, to be paid on a 90 days' sight draft, to be accepted upon delivery of bill of lading.

Because of the numerous branches of New York export and commission houses in South Africa and the fact that the three largest banks of that country maintain agencies or their own branches in New York, the financing of shipments to South Africa does not ordinarily offer any difficulties.

The insistence of American firms on payment f. o. b. New York is considered by South African firms as distinctly unfair. They claim this arrangement to be too one-sided. It places the entire burden upon the importer, implying, also, that he inspires no confidence as to his solvency and fairness. It is not right, they feel, that they should be called upon to pay money for goods before the shipments have been proved to be up to sample or specifications. They have to trust the manufacturers implicitly, while the latter do not in any way reciprocate that trust. Business is undoubtedly a matter of give and take. The seller is as eager and as much in need to sell as the purchaser to buy. One can not do without the other. A logical, fair, and mutually satisfactory compromise should consequently be arrived at in the matter of terms of payment. Payments f. o. b. New York, however, are actually accepted by South African importers and, fortunately, their financial resources generally permit them to meet such terms without any difficulty. Few importers will be handicapped on this account.

Generally speaking, American implements have been found better suited to the conditions prevailing in South Africa than those made in other countries, and it can not be said that American trade has suffered to any extent on account of our strict terms of payment. It is probable, however, that if manufacturers of other countries should some time become able to supply the South African trade with goods similar in quality and price to those shipped by American manufacturers, the lack of confidence expressed heretofore by American firms will be taken into account and their business will suffer greatly as a consequence.

English firms, in the great majority of cases, supply their South African agents with goods on open account. At the end of every

yearly quarter a draft is made at 90 or 180 days, covering the invoices rendered during that quarter. This is then forwarded to South Africa for acceptance and payment. As can be seen, this arrangement provides for a credit of from three to nine months. It has been difficult to ascertain the exact terms upon which German manufacturers have sold to their South African agents, but everything points to the fact that they have at least been as liberal as English manufacturers in this regard. The same can be said of Swedish manufacturers.

CREDITS.

The South African firms engaged in the importation and sale of farm machinery enjoy, as a whole, a very satisfactory financial position. In many cases they are very wealthy and have been established for many years. The fact that they are interested in many other lines besides farm machinery improves their financial stability. In the event of droughts or some other rural disability, they have other lines of business to fall back upon. This permits them to withstand, without financial embarrassment, a period of depressed agricultural conditions. All these firms, more or less extensively, supply the requirements of the large population engaged in mining, which insures them a continuous, stable, and profitable business.

Requests from these firms for terms of payment other than cash f. o. b. New York deserve careful consideration, and in most cases a logical view of the situation will cause these requests to be granted. In most cases when better terms of payment are asked this is done to facilitate a greater turnover in the sale of implements. This is important to the manufacturer. South African importers, in referring to the question of more liberal terms of payment, have indicated their willingness to pay an adequate rate of interest for the period the credit is given.

Whenever the question of extending credit comes up reports should be obtained in order to consider properly the advisability of doing so or otherwise. The facilities for obtaining such information are ample. Business organizations, banks, and commercial agencies exist that are exceptionally well equipped to supply information to enable the manufacturer to come to an intelligent decision.

Three South African banks, all of which have branches in every city, town, and hamlet of South Africa, have either their own offices or agencies in New York. When necessary these banks will gladly supply to American manufacturers credit information concerning South African firms. The reports furnished by these banks are generally quite brief, but they nevertheless will be found useful and as accurate as possible. It would not be proper to abuse the courtesies extended by these banks in this connection, but whenever various opinions are desired regarding the financial standing of a South African firm these banks can be addressed without hesitation.

ADVERTISING.

South African importers expect the manufacturers to furnish them, free of charge, suitable quantities of catalogues and circulars, as well as electrotypes for newspapers and catalogues. American manufacturers often fail to supply the right kind of electrotypes.

Importers claim that electros from wood cuts—"line electros," as they are generally called in South Africa—are frequently difficult to obtain from the manufacturer. Because of the inferior quality of paper used in South African newspapers it is essential that line or wood-cut electrotypes be used instead of halftone cuts. Owing to the various uses made of electrotypes of all kinds American manufacturers should be ready to supply these in the 1, 2, and 3 column sizes when they are requested.

Lithographed or tin posters illustrating implements in colors are very much appreciated by South African firms. They understand, however, that if the manufacturer does not produce such posters for his regular trade they can not be made especially for them except at great cost.

So far the necessity for American manufacturers to supply special catalogues in both English and Dutch for distribution among farmers has not arisen. The large firms selling implements in South Africa publish their own catalogues, which are often printed separately in both these languages. It should be remembered that the Dutch spoken in South Africa is a corruption of the Dutch spoken in Holland.

In connection with this question of language it may be noted that on the coast and in all the large towns the English language is generally spoken. On a large majority of the farms and in the country districts the Cape Dutch or Taal holds its own as the language of the people. In the western portions of Cape Province and in the country districts of the Orange Free State and Transvaal the people are mostly Dutch. In the eastern districts of Cape Province the influx of English settlers has turned the scale and English is chiefly used, even among the farmers. In Natal, Dutch is seldom used. All Government publications and notices are published in both languages, either of which may be used by the members of the legislature and senate at their sittings. English, however, has remained the business language almost exclusively.

It is well understood in South Africa that the prices at which American manufacturers sell their goods do not permit them to make any contributions toward local advertising. The importers know that such local advertising is entirely for their own account. When a manufacturer has succeeded in establishing a fairly large number of agencies throughout the country, however, he has often found it to his advantage to advertise his goods for his own account in one or two of the more popular agricultural journals of the country. The names of the various agents the manufacturer has in South Africa are shown at the bottom of the advertisements, when this is done. The demand for the manufacturer's goods has frequently been stimulated by such action, and it has invariably induced the importers to take a greater interest in selling them. In some instances the manufacturer has paid one-half the cost of such advertisements and the various agents have prorated the remainder among themselves.

For a manufacturer to attempt to reach South African merchants by advertising in the agricultural publications of that country is considered ineffective. Correspondence and the sending of catalogues to the importers would be a far more effective and economical means of interesting them. Whenever a manufacturer undertakes advertising in South Africa on his own account, he should remember

that conditions there are different from those prevailing in the United States. A tractor manufacturer recently advertised his goods in that country, the copy containing such phrases as "3-plow and 10-plow tractors." This would be misleading in South Africa. Such tractors could not pull in that country the same number of plows as in the United States.

WEIGHTS, MEASURES, AND CURRENCY.

The weights and measures used in the United States are prevalent in South Africa, but Dutch measures for land and bulk predominate. These are:

1 morgen=2.11654 acres.
1 muid of wheat, maize, peas, or beans=200 pounds.
1 muid of oats or potatoes=150 pounds.
1 muid of barley=160 pounds.
1 muid of onions=120 pounds.
1 muid of groundnuts=100 pounds.

The coinage in use throughout the Union of South Africa is the same as that of Great Britain.

RAILWAY AND STEAMSHIP FACILITIES.

The Union of South Africa is well provided with railway facilities. The total mileage of railways worked by the administration at the end of 1914 was 8,501 miles, and it is gradually being extended. During the year 1912, the latest for which audited figures are available, 41,450,491 passengers and 11,747,598 tons of freight were carried over the various lines. Virtually the entire system is owned and operated by the Government, and the net profits in 1912 amounted to nearly $10,000,000. The main lines are those between Johannesburg and Cape Town, Johannesburg and Durban, Johannesburg and Port Elizabeth and East London, Port Elizabeth and Cape Town, and the lines running to the border of Portuguese East Africa and to Rhodesia. Numerous short lines connect nearly all the important cities and towns of the Union. The service is good, and the trains are comfortable and run at a fairly good speed. Corridor compartment cars are in general use, and on the through lines the seats are made into beds at night, the only charge made being that for the bedding—2s. 6d. (about 60 cents). The shortest time between Cape Town and Johannesburg, a distance of nearly 1,000 miles, is 37½ hours; between Johannesburg and Durban, 482 miles, 23½ hours; between Johannesburg and Port Elizabeth, 712 miles, 34 hours; between Johannesburg and Lourenço Marques, 394 miles, 19 hours. The passenger fares for single journeys over short distances are 4, 2.66, and 2 cents for first, second, and third class, respectively, per mile; over long distances the corresponding rates are 2.7, 1.8, and 1.5 cents per mile. For the future, it is recognized that the railways are to be worked for the furtherance of trade and intercommunication, and not for profit making.

In traveling from one South African seaport to another use can be made of the frequent steamer sailings available, but, in order to become as intimately acquainted with the country as possible, traveling by rail is recommended.

The farming community is particularly favored in the matter of freight rates. Figures officially quoted show the rates to be from 20

to 80 per cent lower than in Australia. Irrespective of the size of the shipment, the present rate is figured on the basis of 14 cents per 100 pounds for a distance of 100 miles. Farm produce is carried at low rates. Other inducements are reduced fares for both passengers and freight to and from agricultural shows, auction sales of live stock, Government experimental farms, for the conveyance of pure-bred stock, etc. The Union Castle Line also undertakes to carry free of freight charges from England to South Africa all pedigreed stock intended for breeding purposes. None of the rivers in the Union of South Africa being navigable, there is a complete absence of internal transportation facilities by water.

In pre-war times it was customary for American travelers to go to South Africa via Southampton, England. The Union Castle Steamship Co., contractors to the Imperial and South African Governments to carry the mails, dispatched a mail steamer every Saturday and an intermediate steamer every week from Southampton for South African ports. Calls were made at Madeira by the mail steamers and at the Canary Islands by the intermediate steamers. The next calls were made at Cape Town, Mossel Bay, Port Elizabeth, East London, and Durban, the intermediate steamers calling also at Lourenço Marques. The time occupied by the mail steamers in the trip from Southampton to Cape Town was 17 days. The rates of passage from England to South Africa by these mail steamers, which still prevail at this time, were $150 to $220 for first-class passage and $90 to $140 for second-class passage. Representatives of American firms will find it to their benefit to travel first-class because of the opportunity thus afforded them to meet prominent South African business men. Second-class accommodation, however, is quite comfortable, and often preferred for experts and mechanics. A dinner suit is considered an indispensable part of the wardrobe of a first-class passenger.

The Deutsche Ost Afrika Line before the war maintained a fortnightly service from Hamburg, Amsterdam, and Antwerp to South Africa. Other important lines engaged in the South African trade were the Bucknall Line, Natal Line, and Harrison-Rennie Line from London, and the Clan and Ellerman-Harrison Lines from Glasgow via Liverpool to South African ports. These lines, called the "conference lines," made a contract in 1912 with nearly all the principal importers and shippers of South Africa whereby the owners undertook certain obligations as regards uniform freight charges, and the importers and shippers agreed to ship all goods by their steamers.

There were six steamship lines at that time maintaining a direct and fairly regular service from New York to Cape Town and other South African ports, namely, the Union Castle, Houston, Prince, Hansa, Bucknall, and Clan Lines. Each of these dispatched a ship every fortnight or every month, as cargo offered. As there was not much export trade to the United States, none of the steamers returned directly to New York but usually proceeded to India, the Far East, or England. The time of passage from New York was usually from 30 to 35 days. No passengers were carried by the steamers of these lines. The rates of freight prevailing in pre-war times on shipments from New York were slightly higher than those from England. The difference was usually between $0.25 and $1 per ton, seldom exceeding the latter amount. The rates from Montreal and other Canadian ports on the Atlantic seaboard were usually the same as those from New York.

All the British steamship lines have considerably reduced the number of sailings from England to South African ports since the beginning of the war. The Union Castle Line has maintained a fairly good service, however, and, with a few exceptions, mail steamers have been dispatched every week, although almost invariably these have taken a longer time to make the voyage.

One of the developments arising out of the war has been the increased number of direct sailings from the United States to South Africa, and vice versa, because of the increased American trade with the Union. Some of the steamers diverted to this trade possess satisfactory accommodation for a limited number of passengers, which has always been eagerly taken up. It is not impossible that, when normal shipping conditions are reestablished, a regular and permanent service from and to the United States will be established for the conveyance of passengers, as well as freight. This would reduce about one-half the present cost of the voyage, and would also effect a saving in the number of days required for the journey. Moreover, the expenses occasioned by the change of steamers in England, which often involves a stay of several days in that country, would become unnecessary.

FREIGHT RATES DURING THE WAR.

It is generally well known that the freight rates on goods shipped from the United States to South Africa have increased from 400 to 500 per cent since the beginning of the war. It may surprise some, however, to know that the rates from English ports have increased only about 60 per cent and that those from Canada in June, 1916, were only about 200 per cent higher. Taking the rates for mixed goods, the actual increases compare as follows: The pre-war rates per ton of 40 cubic feet were—From England, $9.10; from Canada, $9.50; and from New York, $9.50. The rates June 30, 1916, were—From England, $15.37; from Canada, $25.15; and from New York, $41.90. There is not only a very great difference between the New York and English rates, but also between the New York and Montreal rates, which, as stated, used to be the same in pre-war times. This matter was referred to by the president of the Cape Town Chamber of Commerce in his address at the annual general meeting of that body, on May 15, 1916, as follows:

> An anomaly to which attention should be directed is the difference in freight between Canada and Cape Town and the United States and Cape Town. Though the distance is about the same, and the conditions similar, on one class of goods there is no less than $15 difference in favor of Canada. For instance, the *Clan Lamont* and *Afghan Prince* from New York charged $36 plus 15 per cent per 40 cubic feet, as compared with the *Benguella* from Canada, which sailed some 10 days later than the above steamers and charged $22.50 plus 15 per cent per 40 cubic feet.

This has set a very unfavorable precedent indeed, and, unless freights are adjusted on the basis of those prevailing before the war, American trade in general will suffer a severe hardship, and the American exporters of agricultural machinery and implements in particular will find it extremely difficult to meet the competition of British and Canadian firms, which, from all appearances, are more active and aggressive in the South African trade than is perhaps the case in that of any other country.

VI. SOUTH AFRICAN INTERNATIONAL TRADE.

In considering the foreign trade of the Union of South Africa for the past two years the European war and the part played by shipping must necessarily be remembered. It would be fruitless to attempt any definite, conclusive estimate of the effects that the war, the lack of cargo space, and the scarcity of labor and material have had upon South African trade. The outstanding feature in the trade of that period is the fact that in spite of all these difficulties the demand for goods, with few exceptions, has been exceedingly well maintained. The table below, prepared from the official trade returns, indicates the foreign commerce of the Union, but the fact must be kept in mind that no returns are given therein for the exports of gold since the war began; these will not be made public until the cessation of hostilities. The import figures show that the trade of the country is not suffering greatly as a result of present conditions, the chief restrictions on its imports being those due to the shortage of shipping and those self-imposed by cautious merchants, who fear a lowering of prices when the war is over. Orders totaling large amounts placed by South African merchants are said to have been refused by the manufacturers owing to their inability to fill them. Considering the last five years together, the deduction can be made that South Africa is in the midst of a period of steady expansion, checked only in part by temporary conditions arising from the war. In the following table the import figures include merchandise, Government stores, and specie, and the export figures include South African produce, reexports, and specie:

Trade.	1911	1912	1913	1914	1915
Imports	$185,099,737	$193,906,715	$208,271,975	$177,100,991	$164,650,932
Exports	278,890,423	307,916,805	324,398,709	195,746,606	82,046,138
Total	463,990,160	501,823,520	532,670,684	372,847,597	246,697,070

THE IMPORT TRADE.

The decreased imports in 1914 and 1915 can be attributed chiefly to three causes. In the first place, various foodstuffs were produced within South Africa in larger quantities during the past two years, thus reducing the necessity of importations from overseas. Second, the stoppage of diamond-mining operations undoubtedly restricted the importation of the supplies required by that industry. Finally, as might be expected, more caution was exercised in the purchase of goods, the aim naturally being to obtain longer use and wider service from the materials and supplies on hand. The export of ostrich feathers was also considerably smaller, and the farmers interested in those birds did not have the same purchasing power as in prosperous seasons. Considering that the decrease in imports in 1915 was only slightly over 20 per cent as compared with 1913 (the latter year rep-

resenting the highest mark since the Union was formed), there is certainly no cause for pessimism or doubt as to the sound condition of the South African trade, despite the present abnormal times.

Since the beginning of August, 1915, an improvement in all branches of trade has been very noticeable. During the last five months of that year the imports amounted to $71,989,760, while those of the corresponding period of 1914 were $59,277,897, showing an increase of $12,711,863. For the first six months of 1916 the imports were $96,422,456, while those of the corresponding period of 1915 were $73,191,858, an increase of $23,230,598.

The imports of agricultural machinery and implements have fared as badly, perhaps, as those of any other commodity. In 1913 the imports under these headings amounted to $2,997,200 and in 1915 to $1,631,601. Considerable improvement has been experienced since the beginning of 1916. During the first six months of that year the imports of these goods amounted to $839,977, as against $486,621 for the corresponding period of 1915.

THE EXPORT TRADE.

The statistical returns for the year 1915 show increases, as compared with the previous year, in the exports of all agricultural products of the Union except bark, ostrich feathers, fresh fruit, mohair, and horns. The following are the chief items in which increases occurred:

Articles.	1914	1915	Articles.	1914	1915
Wool	$20,625,225	$26,181,921	Spirits	$37,672	$170 795
Hides and skins	7,651,394	8,155,252	Hay and fodder	232,195	283,984
Corn, grain, and meal	2,360,734	3,551,124	Potatoes	49,765	83,198
Meats	73,504	574,889	Sugar, molasses, and treacle	80,210	242,288
Tobacco	90,804	176,673	Dried fruit	2,905	76,920
Wines	46,849	101,963	Eggs	54,602	101,213

Some of these figures are very remarkable, and the increases recorded are probably due in some measure to war conditions. While the Union is losing, temporarily at least, on diamonds and ostrich feathers, which in recent years ranked second and fourth, respectively, in importance among the exports, it is building up new branches of export trade, which should be of marked advantage to the country in the years to come.

The following table shows the total exports of the Union for five recent years, excluding raw gold, diamonds, and ostrich feathers:

Trade.	1911	1912	1913	1914	1915
Exports	$278,890,423	$307,916,805	$324,398,709	$195,746,606	$82,046,138
Deducting gold, diamonds, and feathers	221,909,436	243,837,247	255,780,860	133,340,163	11,776,492
Total exports other than gold, diamonds, and feathers	56,980,987	64,079,558	68,617,849	62,406,443	70,269,646

It will be readily seen that the position of the Union in 1915 was quite satisfactory. Indeed, the total South African exports, aside

from the three items excluded, were even higher than in 1913, a year untroubled by war conditions and the best trade year the Union has had since its foundation. The output of what may be regarded as the permanent productive industries of the country—those to which it is chiefly looking for the building up of its future prosperity—has been fully maintained during the past five years, and markets have been found abroad. There is much reason for satisfaction in the fact that the recent loss of trade is wholly attributable to an inevitable shortage in the speculative industries of diamonds and ostrich feathers. The production of gold was fully maintained during 1914 and 1915, and this item of South African production is not accountable for any loss. The diamond industry is one that can be carried on with a great deal of elasticity, the production being generally governed by the demand, in order to maintain high prices—that is, the production of diamonds can be increased to meet all reasonable demands likely to be made upon the industry. Active diamond-mining operations have been discontinued since the outbreak of war, and the companies interested have limited their activities to working their reserves of ore. The exportation of diamonds amounted to $58,478,419 in 1913 and decreased to $8,156,925 in 1915. This industry is, however, gradually improving its position, as indicated by the fact that during the first six months of 1915 the exports were only $1,521,895, while during the corresponding period in 1916 they amounted to $8,646,476, a sum greater than the value of all the diamonds exported during the whole of 1915.

The ostrich-feather trade is subject to more or less the same vicissitudes as that in diamonds, and the exports, which amounted to $14,373,631 in 1913, decreased to $3,619,566 in 1915. No recovery has been observable, so far, in the export trade in this commodity.

In general, the exports for the first six months of 1916 show a decided improvement over those for the same period of the preceding year. Excluding bulk gold only, the total exports for the period under consideration amounted to $52,806,202, as against $35,956,213 in 1915, an increase of $16,849,989.

DISTRIBUTION OF FOREIGN TRADE.

The imports and exports of merchandise during 1915, by articles and countries, were as follows:

IMPORTS.

Articles and countries of origin.	Value.	Articles and countries of origin.	Value.	Articles and countries of origin.	Value
Apparel and slops:		Coffee:		Corn, grain, and flour—Continued.	
Total	$9,434,815	Total	$2,627,910	United Kingdom	$304,424
France	38,319	Brazil	2,369,197	United States	3,061,384
India	61,425	Costa Rica	95,608	Cotton piece goods:	
United Kingdom	9,055,705	United Kingdom	12,682	Total	8,764,430
United States	188,801	United States	238	Italy	440,506
Bags, not leather:		Confectionery and jams:		Switzerland	121,419
Total	3,126,954	Total	1,621,556	United Kingdom	7,925,684
India	2,782,850	France	27,540	United States	62,042
United Kingdom	338,548	Switzerland	131,250	Cotton rugs and blankets:	
United States	3,402	United Kingdom	1,382,436	Total	1,003,642
Boots and shoes:		United States	31,661	Italy	67,504
Total	4,766,434	Corn, grain, and flour:		Netherlands	243,602
France	1,173	Total	7,608,881	United Kingdom	658,589
Switzerland	99,681	Argentina	1,328,506	United States	6,264
United Kingdom	4,233,273	Canada	2,199,731		
United States	349,478				

IMPORTS—Continued.

Articles and countries of origin.	Value.
Cotton underwear and hosiery:	
Total	$3,725,568
Japan	397,039
Switzerland	45,658
United Kingdom	2,962,891
United States	222,911
Drugs and chemicals:	
Total	5,221,545
Canada	209,898
Norway	71,800
United Kingdom	4,307,632
United States	310,366
Earthenware and chinaware:	
Total	1,036,943
France	6,619
Japan	12,268
United Kingdom	462,064
United States	1,840
Fish:	
Total	1,291,062
Canada	202,846
Norway	347,829
United Kingdom	340,471
United States	129,133
Furniture:	
Total	1,741,145
Canada	59,104
India	122,130
United Kingdom	1,276,512
United States	147,075
Glycerin:	
Total	1,767,186
France	287,450
Netherlands	69,980
United Kingdom	1,363,165
United States	5,461
Haberdashery and millinery:	
Total	4,539,865
France	458,449
Switzerland	669,962
United Kingdom	3,011,998
United States	130,028
Hardware and cutlery:	
Total	4,886,365
Canada	66,623
Sweden	114,592
United Kingdom	3,410,745
United States	1,198,561
Hats and caps:	
Total	1,020,343
India	23,987
Italy	25,087
United Kingdom	948,267
United States	8,020
Implements, agricultural:	
Total	2,848,177
Canada	167,103
Implements, agricultural—Contd.	
Sweden	$106,523
United Kingdom	475,832
United States	509,673
Iron bars, bolts, and rods:	
Total	1,098,154
Germany	2,331
Sweden	64,808
United Kingdom	987,676
United States	295,411
Iron sheets and plates:	
Total	1,848,091
Belgium	1,046
United Kingdom	1,261,295
United States	585,479
Leather, manufactures:	
Total	1,136,392
Australia	664,131
Portugal	1,090
United Kingdom	291,460
United States	177,403
Machinery, manufacturing:	
Total	1,482,185
France	6,828
Netherlands	7,417
United Kingdom	1,377,541
United States	78,088
Machinery, mining:	
Total	3,184,695
Germany	10,570
Sweden	11,801
United Kingdom	1,788,970
United States	1,166,656
Meat:	
Total	1,027,677
Australia	177,691
Denmark	402,265
United Kingdom	459,373
United States	411,351
Milk, condensed:	
Total	1,997,372
Netherlands	214,511
Switzerland	124,354
United Kingdom	1,144,202
United States	90,025
Motor cars and parts:	
Total	2,241,836
Canada	703,433
France	7,865
United Kingdom	438,545
United States	1,099,002
Oil, kerosene:	
Total	1,184,563
United Kingdom	5
United States	1,184,555
Oilman's stores:	
Total	$1,018,981
France	52,398
Netherlands	16,513
United Kingdom	703,292
United States	209,094
Paper:	
Total	1,578,424
Canada	287,645
Sweden	254,630
United Kingdom	761,709
United States	91,688
Rice:	
Total	1,917,450
India	1,387,226
Siam	301,714
United Kingdom	9,991
United States	818
Spirits, potable:	
Total	1,806,415
France	322,493
Netherlands	77,961
United Kingdom	1,373,638
Stationery and books:	
Total	2,813,630
India	4,414
Netherlands	47,298
United Kingdom	2,470,479
United States	221,305
Tea:	
Total	1,557,688
Ceylon	1,022,700
India	367,217
United Kingdom	126,291
United States	19
Wood and timber:	
Total	3,098,086
Norway	340,217
Sweden	790,456
United Kingdom	3,056
United States	486,713
Woolen blankets and rugs:	
Total	1,009,253
Italy	55,162
Netherlands	11,261
United Kingdom	933,390
United States	720
Woolen cloth and piece goods:	
Total	1,784,263
France	50,845
Switzerland	8,746
United Kingdom	1,715,037
United States	1,986
Zinc and zinc ware:	
Total	1,004,898
France	8,050
United Kingdom	11,697
United States	984,697

EXPORTS.

Articles and countries of destination.	Value.
Angora hair:	
Total	$3,346,375
Australia	1,650
United Kingdom	2,431,615
United States	913,112
Asbestos, raw:	
Total	216,501
India	10
United Kingdom	216,419
Blasting compounds:	
Total	782,373
Australia	347,117
New Zealand	107,063
United Kingdom	160,054
Coal:	
Total	5,546,082
Ship's stores	4,458,736
New Zealand	182,509
United Kingdom	15
Copper ore and regulus:	
Total	3,416,565
United Kingdom	3,416,565
Diamonds, rough:	
Total	8,156,925
India	64,078
Netherlands	33,511
United Kingdom	8,039,473
United States	19,850
Fish, dried and preserved:	
Total	643,604
France	41,852
Mauritius	77,548
Fish, dried and preserved—Continued.	
United Kingdom	$427,693
United States	8,760
Fruit, fresh:	
Total	319,778
Ships' stores	21,335
Portuguese East Africa	20,663
United Kingdom	257,389
Hides and skins:	
Total	8,168,260
Australia	20,619
Canada	88,765
United Kingdom	6,584,477
United States	1,459,960
Maize:	
Total	3,073,905
Australia	756,430
Portuguese East Africa	25,511
United Kingdom	2,270,539
Meats, frozen and fresh:	
Total	589,031
Australia	143,329
United Kingdom	423,581
Oil, whale:	
Total	399,152
United Kingdom	387,861
Ostrich feathers:	
Total	3,619,566
Australia	21,505
British East Africa	26,499
Ostrich feathers—Continued.	
United Kingdom	$2,204,125
United States	1,352,201
Tin ore and concentrates:	
Total	1,877,987
India	21,899
Straits Settlements	1,240,904
United Kingdom	615,184
Tobacco:	
Total	394,950
Australia	30,936
Southwest Africa	169,408
United Kingdom	32,693
United States	49
Wattle bark:	
Total	950,154
Australia	170,824
India	16 581
United Kingdom	731,995
United States	29,958
Wool, scoured:	
Total	3,011,891
Italy	36,893
United Kingdom	2,176,387
United States	798,612
Wool, unwashed:	
Total	23,132,674
Canada	5,256
Italy	7,972
United Kingdom	16,428,935
United States	6,686,464

The total imports of merchandise and exports of South African produce (except ship's stores) during 1915, by countries (excluding Rhodesia), were as follows:

Countries.	Imports.	Exports.
British Empire:		
United Kingdom	$83,060,473	$47,980,064
Canada	4,759,822	106,425
India	6,159,173	410,558
Ceylon	1,112,322	139,498
Australia	2,211,995	1,475,396
Straits Settlements	57,760	1,277,102
Other	681,840	1,644,755
Total British Empire	98,043,385	53,033,798
Foreign countries:		
Denmark	544,878	.....
France	2,357,907	43,580
Germany	566,086	.....
Netherlands	2,488,622	33,691
Dutch East Indies	827,290	.....
Foreign countries—Con.		
Italy	$1,650,113	$45,988
Norway	1,074,703	.....
Portuguese East Africa	700,265	504,149
Sweden	2,189,560	.....
Switzerland	1,545,752	.....
Japan	1,078,382	.....
United States	21,476,584	11,331,791
Argentina	1,535,040	149,368
Brazil	2,392,868	.....
Chile	541,082	.....
Other	2,373,158	471,958
Total foreign countries	43,342,290	12,580,525
Grand total	141,385,675	65,614,323

DOMINANT POSITION OF UNITED KINGDOM.

The lead of the United Kingdom in both import and export trade is very marked and is due to the fact that South Africa is a British dominion, that there is a 3 per cent preference in the tariff in favor of English goods, and that the largest and most important firms in the Union are English, with offices or branches in England. During 1915 the United Kingdom furnished 58.4 per cent and the British dominions 69.5 per cent of the merchandise imported. The United Kingdom's lead is still more evident in the export trade. In 1915

the United Kingdom purchased 60.2 per cent and the British Empire 75.8 per cent of the total exports, which percentage of exports would be greatly increased if the figures for raw gold exported were available. Many mercantile institutions of South Africa are largely controlled by buying houses in England, which exist on the commissions obtained in the ordinary course of trade. These buying houses are averse to their agents buying outside of the United Kingdom, for such a course not only reduces their income from commissions but may lead to a growing trade with other countries, which in time may render their existence unnecessary. These buying houses in England are often constituted by former South African merchants.

TRADE OF UNITED STATES.

The following table shows the very rapid expansion of American trade in South Africa:

Years.	Imports from United States.	Exports to United States.	Total trade.
1907	.....	.....	$9,466,626
1912	$15,735,321	$2,631,930	18,367,251
1915	21,485,899	11,349,067	32,834,966

In 1912 the United States, for the first time since the formation of the Union, held first rank among the foreign countries in the import trade. In 1915 the United States ranked first in both exports and imports, not only among the foreign countries but also among the countries of the British Empire other than the United Kingdom. As a matter of fact, the imports from the United States lack but a few thousand dollars of being as large as those from all other foreign countries combined. The exports of South Africa to the United States are more than four times as great as those to all other foreign countries combined, and greatly exceed those to countries in the British Empire other than the United Kingdom. The trade of the United States is, therefore, second only to that of the United Kingdom, being far ahead of that of any of its other rivals. In a single year the exports from South Africa to the United States increased more than 800 per cent. The following table shows the notable increase in American trade with South Africa in 1915 as compared with 1914:

Character of trade.	1914		1915	
	Value.	Percentage of total.	Value.	Percentage of total.
IMPORTS, EXCLUSIVE OF GOVERNMENT STORES AND SPECIE.				
From United Kingdom	$86,332,503	56.6	$83,060,473	58.4
From other parts of British Empire	19,513,750	12.8	15,742,344	11.1
From United States	14,659,645	9.6	21,485,899	15.1
From other foreign countries	31,925,486	21	21,856,391	15.4
Total	152,431,384	100	142,145,107	100
EXPORTS, EXCLUSIVE OF SPECIE.				
To United Kingdom	165,181,395	85	48,840,690	60.2
To other parts of British Empire	9,862,979	5.2	12,597,198	15.6
To United States	1,414,536	.7	11,349,067	14
To other foreign countries	12,059,406	6.2	2,791,181	3.4
Shipped as ship's stores	5,587,156	2.8	5,308,213	6.5
Shipped through the post	231,451	.1	213,829	.3
Total	194,336,923	100	81,100,178	100

Eighty-seven vessels, with a total registered tonnage of 263,817, arrived at South African ports from the United States in 1915, and 34 vessels, with a tonnage of 92,389, cleared for the United States the same year. A considerable quantity of American goods arrived, however, by way of Canada.

War conditions have, in a way, brought about this large increase in our trade with South Africa, but it is admitted that many of our staple commodities are gradually finding their way into the South African market and are being permanently established there. No small measure of our increased success in South Africa is attributable to the energetic work of the American consuls in that country, all of whom have established commercial information bureaus, where American catalogues and papers are available to the public. Some of the consulates are giving particular attention to trade matters by having officials in special charge of this work. The increase of American trade is also attributable to the fact that our manufacturers have to deal at home with quite similar conditions, to their inventive genius in supplying something new and attractive, and to their over-sea selling arrangements. Several New York export commission houses are well established in South Africa, and they deserve much credit for the steady advance American trade is making in that country. Some of these firms maintain large offices and branch houses in the principal cities of South Africa, and have travelers regularly visiting for trade.

The principal articles that South Africa purchases from the United States are kerosene, lubricating oils, agricultural machinery, motor cars and trucks, typewriters, fencing and baling wire, glucose, wheat, and cash registers, in which articles the American share is larger than that of all other countries combined. The United States leads all other countries in the sale of agricultural machinery and implements. Other articles that the United States exports to South Africa are motorcycles, gasoline and naphtha, watches, electrical material and machinery, tinned meats, hardware, timber and lumber, railway material, mining machinery, iron and steel supplies, nails and screws, stoves, boots and shoes, corsets, etc. The success of the American motor car in South Africa has been phenomenal, and all the leading American makes are well represented. The United States does about 80 per cent of the motor-car business. In 1913 the imports of motor cars from all countries amounted to nearly $6,500,000, and in 1915 to about $2,300,000, the decrease being chiefly due to the inability to obtain cargo space and the high ocean freight rates.

The exports to the United States are chiefly wool, hides and skins, mohair, ostrich feathers, wattle bark, and buchu leaves. For the first six months of 1916 the exports to the United States represented 19.7 per cent of the total, whereas in the corresponding period of the previous year they were only 13.2 per cent.

In addition there is a good deal of trade between the United States and South Africa that is credited to other countries—England in particular. Moving-picture films, phonographs, and photographic material of American manufacture are imported in large quantities, yet the statistics of imports do not indicate that the United States is an important source of supply. A similar condition undoubtedly exists in connection with South African exports. The United States

is a very large buyer of South African diamonds, yet it is credited with only about $20,000 worth in 1915 and, while ostrich feathers are increasingly shipped direct to the United States, there must be large shipments for America for which England receives credit.

There should be many openings for American trade when hostilities cease. All South African merchants have had a certain number of business transactions with American firms and, in general, are very appreciative of the attention given to their business by American exporters. There has been much conservatism in the purchases of stock during the war, and at its termination South African merchants will undoubtedly place large orders with firms so situated that they can reasonably and expeditiously fill them. The United States should be able to do this better than any other country, and American manufacturers and exporters should make ready to seize that favorable opportunity. The manager in the principal South African office of an American mercantile agency states that a moderate estimate of the total business that the United States will be able to do when peace is made is between $50,000,000 and $100,000,000 annually.

TRADE BY PORTS AND ROUTES.

The imports and exports of merchandise through the various ports in 1915 were as follows:

Ports.	Imports.	Exports.
Cape Town	$41,799,011	$19,219,935
Port Elizabeth	34,374,124	15,719,004
East London	15,968,607	11,866,707
Durban	57,097,924	20,393,925
Other Union ports	1,355,062	4,641,483
Delagoa Bay	13,282,323	4,102,897
Beira and Feira (via Portuguese East Africa) and overland	6,345,765	6,171,170
Total	170,222,816	82,115,121

The trade through Delagoa Bay consists chiefly of goods destined to or exported from the Transvaal. The import trade by this route is regulated by an agreement between the government of Portuguese East Africa and the Union of South Africa, providing that the import trade into the so-called competitive areas, comprising Johannesburg and the immediate surrounding territory of the Transvaal, shall be so apportioned as to allow not more than 55 per cent of the total imports to enter via Delagoa Bay, and the remainder via Union ports. Owing to exigencies arising from the war, the clauses of this agreement have not been in full operation. Since the beginning of hostilities in Europe, Durban, Cape Town, Port Elizabeth, East London, and Delagoa Bay, in the order named, were the principal ports of entry as regards value of imports, as well as the chief ports for the shipment of South African products.

EFFECTS OF THE WAR.

The year following the outbreak of hostilities was one of much difficulty and anxiety for the commercial community of South Africa. The increase of freight rates and the fluctuations of marine insurance introduced an element of uncertainty for the importer, who, in consequence, found it almost impossible to forecast the landed cost

of even the most ordinary commodities. Further, the disorganization of shipping facilities, owing to the elimination of all enemy vessels, the large demands made by the British and Allied Governments on their shipping, and the destruction of a percentage of the mercantile marine made it very difficult to obtain adequate supplies of goods from overseas and to send the South African produce abroad. Wool and wattle bark had been purchased in large quantities by Germany before the war, and while it was not difficult to find an outlet for these products elsewhere, still, during the first months of the war, these industries underwent very anxious times, which intensely aggravated the depression already felt. All but a small proportion of the wattle bark produced by South Africa went to Germany before the war, as that country was able to handle the product in bulk. A large English demand could not be created at once, for the reason that English tanners use chiefly the bark extract. As a result, the exports of this article suffered a decided setback. Diamonds and ostrich feathers, two of the chief products of South Africa, also came practically to a standstill, so far as the export trade was concerned.

The financial condition of the country never wavered, however, in spite of all these drawbacks. Because of the uncertainty as to the probable duration of the war, merchants throughout the Union at once curtailed their orders and indents and, in a number of instances, sent cancellations to their suppliers overseas. As a result, the stocks of the wholesale and retail merchants became very much depleted and all efforts were centered upon the disposal of the stocks on hand, among which there were large quantities of more or less obsolete goods, for which very good prices were realized. This led to an exceptional situation. The South African banks have had more money than they could use, the merchants preferring to leave their money lying idle, but ready to use when hostilities cease, rather than risk purchasing goods at enhanced values from either Europe or America and having such stocks left on their hands when prices, at the close of the war, became nearer to normal. There has consequently been an abundance of money in South Africa, and the merchants, while suffering a loss in their volume of trade, are in a better financial position at present than they were before the war.

Certain favorable aspects of South African commerce have emerged out of the struggle now being waged in Europe. Since gold is such an important factor in the economics of the war, operations in the South African gold fields were continued uninterruptedly and with all the energy that the labor market and the stocks of mining supplies on hand made possible. The difficulties in obtaining foreign goods, moreover, directed the attention of traders to the possibility of securing supplies from South African manufacturers and producers. Many firms that, before the war, would have been reluctant to act as distributers for South African goods have taken up the sale of food products and manufactured articles produced in the country. Thus a small boom has been created for the industries concerned, and this is likely to continue after the war, furthering production in certain lines of activity that otherwise would have been ignored or unsupported.

The diamond industry has had no compensation for the disastrous effects of the war, although the exports during recent months show

a decided improvement over those immediately following the beginning of hostilities. The ostrich farmers have realized good prices for the alfalfa and fodder that otherwise would have been consumed by the ostriches, as the Imperial and Union Governments purchased large quantities of that produce and large consignments have been shipped to the forces overseas. These conditions have also directed the attention of the ostrich farmers to the production of dairy products, beef, and pork, which have commanded good prices and have enabled them to take up these new branches of agriculture under auspicious circumstances. Wool, the chief pastoral and agricultural product of South Africa, has been eagerly sought by foreign buyers, and prices nearly 50 per cent higher than in pre-war times have been obtained. The fact that the United States entered the field as a competitor for the purchase of wool, hides and skins, and other South African produce is claimed to have had the effect of greatly improving prices. South Africa has also been benefited, because the stress of war conditions has obliged the country to seek new markets for its products, bringing them to the attention of buyers who were previously unacquainted with them. It is logical to suppose that a large share of this new trade will be retained when the war is over. Summing up everything, the opinion is freely expressed in South Africa that the country has fared better in these distressing times than any other section of the British Empire, and even better than many neutral countries.

As regards commercial conditions when peace is reestablished, South Africa is not looking with any misgivings to that period. Indeed, the general feeling is that, while the country is in a satisfactory position at present, the war is the only factor arresting the greater progress that it could otherwise make, and that, as soon as hostilities cease, an era of unprecedented development of all its varied interests will begin.

The country will probably receive a number of discharged soldiers and sailors, who for the most part will settle on the land, serving to quicken the development of its agricultural resources.

So far as American trade is concerned, there are two questions upon the settlement of which the future of our trade in that country principally depends. One of these is the cost of freights, which, as shown elsewhere, have not only increased enormously since the beginning of the war but have also ceased to remain on an equal basis with those from English and Canadian ports, becoming nearly four times higher than the former and nearly double the latter. If American commerce should be penalized to such an extent, our trade would suffer in a very acute degree. The other important factor is the success or failure of the propaganda, so vigorously prosecuted in certain quarters, to increase the customs preference for British goods. It is difficult to determine what the outcome of this movement will be, but unless very strong pressure is brought to bear it is doubtful whether much or any change will be made in this respect, so far as American goods (and particularly agricultural machinery and implements) are concerned. The fact that the United States has become an important customer for South African products since the beginning of the war should react in a favorable way in connection with this question.

VII. RHODESIA.

GENERAL REVIEW OF THE COUNTRY.

The Zambezi River divides Rhodesia into two parts. The southern part is known as Southern Rhodesia, with an area of 148,575 square miles and a population (census of 1911) of 23,606 whites and 747,471 natives. The part lying to the north is known as Northern Rhodesia, with an area of 290,000 square miles and a population (census of 1911) of 1,427 whites and 820,085 natives. It is estimated that, after 1911 and up to the outbreak of the European war, the white population of Southern Rhodesia increased at the rate of 3,000 per annum. This increase has not been maintained since 1914, but it is quite likely to be resumed when the war is over. The white inhabitants, for the most part, are of British descent.

The country is named after Cecil John Rhodes, the famous South African, whose foresight secured this important State for the British Empire. It is owned and controlled by the British South Africa Co., which was incorporated by a royal charter in 1889. The capital and seat of government of Southern Rhodesia is Salisbury. Northern Rhodesia has a separate administration, which has its headquarters at Livingstone. Language, currency, and weights and measures are such as are in vogue throughout the British Empire.

SOUTHERN RHODESIA.

Southern Rhodesia is at present much the more important of the two divisions. This is due to its larger white population, which has brought about a greater advance in the development of its resources. Southern Rhodesia is divided into two provinces—Matabeleland in the south, of which Bulawayo, a city of 5,800 inhabitants, is the chief center; and Mashonaland in the north, of which Salisbury, with 4,000 inhabitants, is the principal city.

PHYSICAL FEATURES.

Physically, the country may be classified under three heads: (1) Wide, undulating plains, clothed with long grass, but comparatively bare of trees; (2) broken ranges of hills and isolated hills, generally well wooded, where the bulk of the native population is found; (3) bush country and open plains alternating with woodland. A considerable part of the country consists of elevated plateaus from 3,500 to 5,000 feet above the sea, of which the watersheds and uplands are the most suitable for European occupation. It is estimated that the portion of Southern Rhodesia lying above the altitude of 3,000 feet covers an area of nearly 100,000 square miles, and that lying above 4,000 feet an area of about 26,000 square miles.

CLIMATE AND RAINFALL.

While Southern Rhodesia extends from 16° to 22° south latitude and consequently is completely in the Tropics, it does not have the

average climate of the torrid zone. This is due to the great altitude of the country and partly, also, to the cooling effects of the rains falling when the sun is the hottest. On the Rhodesian plateau, which is situated at altitudes varying from 3,000 to 5,000 feet, the maximum temperature rarely reaches 90°. On the low-lying lands, along the Limpopo and Zambesi Rivers, the heat is much more intense and temperatures of 100° and 110° are not rare.

The Rhodesian year is made up of two seasons—the rainy or summer season and the dry or winter season. The rainy season begins in October and ends in March. The dry season includes the other six months. The average duration of useful rains, however, does not cover a period of much more than five months in the greater part of Rhodesia. During the first months of the rainy season, nearly all rain comes down in the form of thunderstorms. During the second half of the rainy season thunderstorms are not so violent nor so frequent, and the rain, instead of having a local character, spreads over large areas and often over the whole country. Averages for several years indicate that in Mashonaland the annual rainfall is from 25 to 40 inches and in Matabeleland from 14 to 25 inches. This rainfall would be quite adequate for agricultural purposes were it not for the fact that it only spreads over five or six months of the year.

Several rainfall averages are as follows: Matabeleland—Tuli, 13 inches; Bulawayo, 23 inches; Gwelo, 24 inches. Mashonaland—Salisbury, 32 inches; Umtali, 32 inches; Melsetter, 44 inches; Victoria, 24 inches. The rainfall is lowest along the western and southern districts and greatest in the eastern districts, or toward the Portuguese East African border.

CHIEF TRADING CENTERS.

The chief trading centers of Southern Rhodesia are Bulawayo and Salisbury. Bulawayo is 1,360 miles from Cape Town and 680 miles from Johannesburg. This has always been the most prominent commercial center of Rhodesia, because of its being a railway center of considerable importance, the junction for Rhodesia and the Belgian Kongo and situated in the direct route of the Cape to Cairo railway. Salisbury is 374 miles from Beira and 301 miles from Bulawayo. From the standpoint of farm-machinery manufacturers and exporters, this is the largest center of Rhodesia, on account of its proximity to the most important and progressive farming districts of that territory. Other cities of commercial importance are Umtali, 1,200 whites; Gwelo, 570 whites; and Gatooma, 400 whites.

ECONOMIC DEVELOPMENT.

The trade of Southern Rhodesia in recent times, with some fluctuations, has substantially increased from year to year, as shown by the following figures:

Trade.	1901	1911	1912	1913	1914	1915
Imports	$10,324,552	$13,137,701	$13,255,236	$14,051,454	$12,197,726	$9,844,589
Exports	2,968,565	13,873,233	14,478,324	16,045,332	13,431,949	[a] 4,025,973

[a] Excluding the value of the gold exported, which information will be kept from the general public for the duration of the war.

The outbreak of the war, as was to be expected, reacted unfavorably upon the progress of Southern Rhodesia's commerce. The chief drawbacks experienced were the difficulty of interesting new capital, the scarcity and high cost of ocean freight space, and the fact that a good many of its settlers left the country to enlist in the armies operating in German Southwest Africa, German East Africa, and Europe.

In considering the internal trade of Rhodesia, the fact must not be overlooked that, owing to its distance from the supplying countries of the world, the value of goods imported, when they reach destination, increases in normal times by 50 to 60 per cent on account of the cost of ocean freight, railage, and customs duties.

IMPORTS.

The chief imports of Southern Rhodesia are agricultural machinery, grain and flour, sugar, confectionery, wines and spirits, furniture, mining machinery, hardware, wearing apparel, cotton goods, drugs and chemicals, railway material, and gasoline and kerosene. Many other articles are also imported in important quantities, as is to be expected, since the country so far has hardly developed any industries at all. An increasing trade is also done in goods purchased by the native population. Owing to the contact of the natives with civilization, they are beginning to purchase plows and other small agricultural implements and are also cultivating a taste for bicycles, sewing machines, cigarettes, European clothing, and hardware.

The United Kingdom heads the list of countries exporting to or importing from Southern Rhodesia. A large trade also exists between Rhodesia and the Union of South Africa. Germany was the country next in importance in Rhodesia before the war—the United States, however, being at that time a close competitor for that position.

Considering that the total imports into Southern Rhodesia have decreased from $13,137,701 in 1911 to $9,844,589 in 1915 and the imports from the United Kingdom from $7,700,740 in 1911 to $5,074,723 in 1915, the present position of the United States in the trade of Southern Rhodesia is very satisfactory indeed. At the present time the United States is outdistanced only by the United Kingdom and the Union of South Africa in the value of its exports into Southern Rhodesia. Of the total imports from non-British countries, which in 1915 amounted to $1,563,373, the United States supplied $710,884, nearly equal to our share of the imports in 1911. The principal articles imported from the United States are agricultural, mining, and manufacturing machinery, electrical goods, hardware and tools, iron, steel, and fencing wire, water-boring machinery, gasoline and kerosene, lubricating oils, typewriters, photographic materials, trucks, furniture, motor cars, and lumber.

EXPORTS.

In addition to the exports of minerals, Rhodesia ships to over-sea countries increasing quantities of maize, hides and skins, and tobacco. The position of the United States in the export trade of Rhodesia for

the year 1915 is quite remarkable. Excluding gold, all of which is exported to the United Kingdom, and dealing entirely with the other produce exported by Rhodesia, the official statistics show that the total exports of that country in 1915 amounted to $4,806,175. Of these the United States took $2,025,096, or nearly one-half. Exports to other countries were as follows: United Kingdom, $925,058; Union of South Africa, $695,914; Northern Rhodesia, $394,361; Egypt, $285,693; Belgian Kongo, $188,421. The exports to the United States were chiefly composed of copper blister, valued at $1,539,108, and chrome ore, valued at $485,190.

MINING.

Mining, which is the chief industry of Rhodesia, is extensively carried on by nearly 150 companies under license from the British South Africa Co., the owner of the mineral rights for the entire country by virtue of the Rudd Concession. The industry employs 2,000 white persons and about 40,000 natives. The mineral output for the year 1915 was valued at $21,408,091, as follows:

Articles.	Quantity.	Value.
Gold ..... ounces..	915,029	$18,605,447
Silver ..... do....	185,233	83,431
Copper ..... tons..	3,517	1,091,624
Lead ..... do....	28	2,710
Chrome ore ..... do....	60,581	855,492
Asbestos ..... do....	2,010	156,652
Coal ..... do....	409,763	599,523
Ironstone ..... do....	9,622	8,268
Diamonds ..... carats..	272	4,944
Total	.....	21,408,091

On the basis of a semiofficial analysis as to the industries that directly or indirectly are responsible for the imports into Southern Rhodesia, it is estimated that 55 per cent of these are for the mining industry and 30 per cent for the agricultural industry, while 15 per cent comprise requisites purchased by the natives. This calculation shows that the mining industry is responsible for more than one-half of the imports, and when it is remembered that except for the wages paid to the natives by those engaged in mining operations they would have little money to spend, it will easily be seen how much really does depend on the mining industry. The farmers also depend almost entirely upon the mines for their markets. The only industries of any importance that are quite independent of mining are tobacco growing, fruit growing, ranching, and corn growing, for export.

In gold production Rhodesia holds sixth place among gold-producing countries. Since 1898 it has produced gold valued, approximately, at $170,000,000.

Large deposits of copper are known to exist in several sections of Rhodesia. In Kansanshi, Northern Rhodesia, deposits showing assays of 54 per cent of copper are being worked. Copper mining in Rhodesia has made greater progress in recent years than the exploitation of any of the other minerals in which the country abounds.

Chrome ore ranks third in value among the minerals of Rhodesia. The deposits of this ore in the Selukwe district are said to be almost

inexhaustible and probably rank as the largest now known in the world. Rhodesia in 1915 supplied about 50 per cent of the world's consumption of chrome ore, estimated at 120,000 tons per annum. Rhodesia exports this ore to the United Kingdom and the United States.

The country possesses very considerable mineral deposits, and many old gold workings are scattered over the country, from which, experts say, gold in fabulous values was extracted. The present scarcity of skilled labor and the high cost of operation, due to high rates of freight and passenger transportation, are said to operate against the more extensive and rapid exploitation of Rhodesia's mining resources.

RAILWAYS.

Communication has been established with every important center of industry in Rhodesia by means of railways. Including the line from Umtali to Beira, the present mileage in Northern and Southern Rhodesia is about 2,500. The railways, for the most part, are owned by the Rhodesian Government. Both freight and passenger rates are high, but exceptions are made in respect to fares and freight rates for immigrants and for the transportation of farm machinery and some other articles required by the farming communities. Passenger fares are $0.06 first class, $0.04 second class, and $0.02 third class per mile. On some of the branch lines, including the main line from Broken Hill to the Kongo border, the rates are $0.12 per mile for Europeans and $0.02 per mile for natives. Farm machinery from Port Elizabeth to Bulawayo pays $1.52 per 100 pounds. The rate from Beira to Bulawayo is $0.99 per 100 pounds.

The bulk of oversea imports of merchandise for Southern Rhodesia are shipped via Port Elizabeth, whence they are forwarded to Bulawayo, Salisbury, Livingstone, and other points in Rhodesia, by rail. Farm machinery intended for Mashonaland is generally shipped through the port of Beira.

DEVELOPMENT OF AGRICULTURE.

When the present difficulties in developing Rhodesia along agricultural lines are taken into account, it must be admitted that the country has made very satisfactory progress in recent years. Present conditions, more temporary than permanent, place a heavy burden upon those taking up the task of taming and cultivating its soil. The country is assuredly endowed with abundant natural advantages for the successful prosecution of both agricultural and pastoral pursuits. The work of subduing its virgin veld, the testing out of its possibilities, the absence of a large white population, resulting in a restricted market for agricultural produce, the high cost of materials required by farmers (owing to the enormous distance from sources of supply), the expensiveness of shipping the produce to oversea markets, and the high rates for internal railway transportation because of the small population its railways serve—these constitute, among other things, the difficulties that are retarding the development of Rhodesia. Gradually, however, year by year, these disadvantages, which have nothing to do with the potentialities of its soil, are

being overcome and the stable conditions already established justify the sanguine expectations of those who have risked their all in the future agricultural possibilities of the country.

Rhodesia, at least for the present, is not, however, a suitable country for the farmer without an adequate amount of capital. The British South Africa Co., as a matter of fact, discourages the immigration of farmers without at least a capital of $2,500. A much greater sum, say $10,000, is reckoned as necessary by those who have actually experienced the vicissitudes of taking up farming in that country. The necessity for so large a capital will doubtless cause a retardation in the agricultural progress of the country, since the United States, Canada, Australia, and other countries would offer a far more attractive field to farmers in a position to invest such a sum of money.

The present suitability of Rhodesia as a whole for development along agricultural lines has not as yet been positively ascertained. It is not infrequent, when one is traveling in that country, to hear the farmers themselves remark that if they were able to realize adequate values for the investment they have made, both in capital and in labor, they would move on to other parts of Rhodesia or to other countries where conditions are more satisfactory. Considering the high type of men who have taken up land in Rhodesia and the capital that they brought with them when settling in that country, an indication is given that the conditions prevailing in some districts are not altogether satisfactory.

Until the country enters an active period of development and increases its production, in order to reduce the cost of operation and transportation (which can only be brought about by a large increase in population), the future of agriculture is largely bound up with the progress of mining. Until that time farming will be almost entirely undertaken to provide the foodstuffs that the population requires.

The natural conditions of Rhodesia point to an eventual expansion of its farming activities in the direction of producing and exporting great quantities of fresh and canned meats, dairy produce, oil seeds, and corn.

The following figures are indicative of the progress of the land industries of Southern Rhodesia between the years 1910 and 1915:

Items.	1910	1915
White farmers in Mashonaland.....number..	990	1,151
White farmers in Matabeleland.....do....	480	600
Cattle.....do....	371,000	840,926
Exports of ox and cow hides.....pounds..	208,699	706,770
Exports of corn.....do....	5,911,123	71,814,851
Exports of unmanufactured tobacco.....do....	322,334	1,560,025
Wool.....do....	5,399	36,123

LAND UNDER CULTIVATION.

The area of land under cultivation in Southern Rhodesia during the season 1915–16 is officially given as 225,754 acres. Mashonaland had 177,909 acres, of which 145,451 acres were under corn and 1,323 acres under tobacco. Matabeleland had 47,845 acres, 37,972 of which

were under corn and 10 under tobacco. The districts showing the largest acreages of land under cultivation are Salisbury, 42,044; Mazoe, 50,801; Lomagundi, 15,532; and Hartley, 26,475. The aggregate acreage in these four districts is 134,852, or nearly 60 per cent of the total area under cultivation in Southern Rhodesia. Mashonaland is making greater progress than Matabeleland in putting land under cultivation, because of its having vast areas of land well suited for that purpose. Matabeleland, owing to its smaller and uncertain rainfall, has not noticeably increased its cultivated area in recent years, nor is it likely to do so in the near future. Its chief value is in connection with cattle raising, which, in that Province in particular, is making most decided progress.

In addition to the area under cultivation, it must be noted that there are several million acres of land that are occupied and devoted to cattle raising. It is hoped that as time goes on crops will be grown in these cattle-raising sections, to provide the stock with feed during unfavorable seasons.

Agricultural development, so far, has been confined to districts within 25 miles from railways. It was estimated in 1913 that Southern Rhodesia had, at that time, about 45,000,000 acres of land available for settlement. Many thousands of farms are already surveyed and ready for occupation. For reasons already indicated, it is not expected that these will be rapidly taken up, although it is not improbable that there will be a comparatively large influx of immigrants into the country after the war.

The statistics of farm and live stock for the year 1915, applying exclusively to the operations of white farmers, give an indication of the present importance of agriculture in Rhodesia.

Items.		Mashonaland.	Matabeleland.
Butter	pounds..	105,548	189,020
Cattle belonging to farmers	number..	231,714	163,142
Cream sold	pounds..	42,723	130,633
Donkeys	number..	4,448	5,888
Farms worked	do....	1,421	724
Farmers	do....	1,151	600
Goats	do....	14,905	11,613
Horses	do....	955	676
Mules	do....	2,024	1,278
Pigs	do....	14,854	4,796
Sheep:			
Merino	do....	7,721	2,420
Other	do....	20,167	19,914
Stock, pure bred	do....	757	1,168
Wool	pounds..	24,037	8,754

LAND BANK.

The establishment of a land bank in 1912 has assisted very materially in the progress of Southern Rhodesian agriculture. This bank confines its business to the farming industry, and advances are made against first mortgages on land property or on deposit of other approved security, and for the purpose of purchase, or part purchase, of land, or to pay off existing liabilities on the land, to effect improvements such as buildings, fences, and irrigation works, and to purchase live stock, agricultural implements, and similar requisites.

Interest on advances is charged at the rate of 6 per cent per annum, and advances must be repaid within a period not exceeding 10 years.

SALES OF LAND.

During the year ended March 31, 1915, 584,984 acres of land were sold by the British South Africa Co. to 213 farmers. This is considered quite satisfactory when one takes into account the abnormal conditions created by the war. The average price paid for unimproved land in Rhodesia is about $1.75 per acre. Mixed farms are usually 1,200 acres in extent, and farms for stock raising 6,000 acres, the latter being in the more remote parts of the country. Land may be purchased outright for cash, subject to the fulfillment of a simple occupation condition, or it may be held under a permit of occupation, with option of purchase for cash, or by installments, at any time within 10 years. If it is held under a permit, the occupant pays rent at the rate of 6 per cent of the purchase price. After obtaining title the proprietor pays an annual quitrent of about $5 per 1,000 acres.

MISCELLANEOUS FARMING NOTES.

Two classes of soil are chiefly found in Rhodesia—red loam and granitic sand. The former is peculiar to Mashonaland, whereas the Matabeleland soils are chiefly of a sandy nature. The red soil is fairly fertile, but it lacks phosphoric oxide, and in consequence phosphoric fertilizers are frequently added to it. Potash is another chemical found in insufficient quantities, and as a result potash fertilizers are also frequently applied. The sandy soils of Matabeleland require quite a thorough system of farming to make them productive. Rhodesia does not have deep, rich, alluvial soils in any very large quantities. As indicated in the discussion of the soils of the Union, however, the excellent climate enjoyed in Rhodesia and the abundance of sunshine modify the relative chemical inferiority of these soils.

Cattle diseases and droughts constitute two serious drawbacks in the agriculture of Southern Rhodesia. The latter are not so much to be feared in the Province of Mashonaland, but their occurrence in Matabeleland has been altogether too frequent to encourage its farmers in the growing of crops. Progress, however, is gradually being made in overcoming these two obstacles. The dipping of cattle is zealously practiced, and seeds and methods of cultivation suitable for the low rainfall are gradually being introduced. The advisability of thoroughly tilling the soil to prevent the undue evaporation of moisture is becoming better understood every year by the farmers in the affected sections.

Owing, possibly, to the high cost of materials and labor, little progress in irrigation has so far been made. Many of the large rivers of Rhodesia carry large bodies of water throughout the dry season, but they have so little fall that their water can not be brought onto the land by gravitation. The lands adjoining the rivers are, furthermore, very warm, often unhealthful, and too far from adequate means of transportation. These rivers will eventually become a great asset to Rhodesia, but at present they are not of much importance.

Farms, generally, are large in size and are certain to remain so for many years. The cheapest thing in Rhodesia is land. It is the

cost of the labor and materials required to make it productive that is delaying its utilization.

Cooperation among farmers is making rapid progress. It has been proved that the present drawbacks in connection with farming can often be removed by collective effort. The sale and exportation of corn and tobacco is largely handled through farmers' cooperative associations, and it is not improbable that the activities of these will soon include the operation of creameries, meat-canning factories, oil factories, etc.

The Rhodesian farmer, as a rule, is a worthy representative of the class of men that for several centuries the United Kingdom has sent forth to open up its vast domains overseas. He is progressive, well educated, persevering, and not infrequently connected with some of England's best and oldest families. His farming methods are generally up to date. Unfortunately, he must of necessity depend on the native worker for the execution of his plans, to which fact, in no small measure, the unsatisfactory results that are often obtained must be attributed. In addition to labor being inefficient and scarce, it is also expensive, when one includes the capitation fees that the farmers must pay to the labor bureau through which native labor is recruited.

There is a great deal of similarity, generally speaking, between farming in Rhodesia and farming in the Union of South Africa. Consequently, what has been said regarding farmers in the latter country applies, more or less closely, to Rhodesia.

PRINCIPAL CROPS GROWN.

A statistical statement published by the administration of Southern Rhodesia in connection with the crops of the season 1915–16 shows that the principal crops grown in the 225,754 acres under cultivation in that country were distributed as follows: Maize, 183,423; sunflowers, 1,766; beans, 2,424; tobacco, 1,310; oats, 1,385; Kafir corn, 2,655; peanuts, 3,043; potatoes, 1,389; wheat, 1,560.

CORN.

Nearly 90 per cent of the land under cultivation in Rhodesia is devoted to corn growing. In 1915 the acreage under corn was 183,423. Often this crop is cultivated on a rather extensive scale. It is not uncommon for a single farmer to have from 200 to 500 acres under corn, and a few have 1,000 acres or more under that crop.

This crop is cultivated along much the same lines as in the Union of South Africa, although disk plows are more often used in preparing the land. Seeding time occurs between November 15 and the end of December. As a general rule, corn is planted 40 inches between rows and 15 inches in the row. For ensilage, corn is planted in January about 30 inches between rows and 15 inches in the row and even somewhat closer. The type of corn chiefly grown in Rhodesia is Hickory King and a hybrid derived from it known as Salisbury White, which in its main features resembles Hickory King.

The disk harrow is found on almost every farm, and after the land has been plowed for maize or for any other crop it is often spike-tooth-harrowed twice and disk-harrowed once or twice before planting. As a rule the harvesting of maize is done as in the Union. The

average yields in Rhodesia seldom exceed six bags of 200 pounds each per acre, but in the favored corn-growing districts the yields are much higher, frequently averaging 10 bags per acre.

The necessity for some system of crop rotation is becoming more and more evident. The red soils that cover so extensive a section of Rhodesia require a rest from corn growing every three or four years. The present practice is to fertilize the land with superphosphates, since the character of the rainfall gives but limited opportunity to rotate corn with other crops. The practice of growing peanuts as a rotation crop, however, has proved satisfactory and is steadily increasing.

Corn no doubt will remain for many years the chief grain crop of Rhodesia. The local consumption is about 600,000 bags per annum. In recent years the country has exported corn as follows: 1911, $82,135; 1912, $33,575; 1913, $116,904; 1914, $544,970; 1915, $599,455.

TOBACCO.

It has been conclusively proved that with proper treatment tobacco of very good quality can be grown in Rhodesia. This industry, however, has had its ups and downs in recent years. The output of 1913 was about 3,000,000 pounds, nearly 10 times the quantity produced in 1911. The tobacco reaped in 1915, however, was only a little more than 600,000 pounds. Evidently the inadequacy of marketing facilities and a lack of organization among growers are to be looked upon as the causes for this retrogressive movement in the tobacco industry. That tobacco growing in Rhodesia will have a bright future is practically assured, and at the present time the industry is again on the up grade. In time it will doubtless become one of the most remunerative industries of the country.

Bright Virginia leaf is chiefly cultivated. It grows well in the Salisbury, Marandellas, and adjoining districts. Several tobacco warehouses have been erected, and a tobacco cooperative association, with a plant of its own to grade and pack the leaf for sale, has been organized. In favorable seasons the average yield gives a gross profit to the farmers of about $200 per acre. The bulk of the tobacco produced in Rhodesia is exported to the United Kingdom and the Union of South Africa, where it is eagerly sought for cigarette manufacturing.

PEANUTS.

Until recently the cultivation of peanuts had been regarded almost entirely as a native's crop, but during the past four years it has made rapid advances in Rhodesia as a staple crop. Peanuts are now grown more or less extensively on numerous farms in Mashonaland and also on not a few in Matabeleland. There is a substantial local market for them, since they form a necessary and cheap food for natives employed both in mines and farms, besides being used as a nutritious food for both cattle and pigs. During 1915 the British South Africa Co. established an oil-extracting factory, and this undoubtedly will prove an incentive to the growing of this crop in a larger way in the future.

Peanuts are planted in November and December in rows from 30 to 36 inches apart and from 12 to 20 inches in the rows, according to

variety. Both shelled and unshelled seed are used, and the Spanish variety is the most popular. Horse hoes are used to keep down weeds and keep the soil open. Weeders are used in some instances in the earlier stages of growth. Peanuts in Rhodesia require from six to seven months to ripen the seed. The average yields in Rhodesia are from 15 to 20 bags of 80 pounds of unshelled nuts per acre. Much greater yields are obtained, however, in individual cases. Harvesting is mostly done by hand, being a laborious and costly process. Natives are sent along the rows to loosen the plants and to shake off the adhering soil from the nuts. The plants are then thrown into heaps or windrows. There is a good opening for the sale of peanut diggers, and the adoption of this and other machines in connection with the cultivation of this crop would no doubt induce farmers to grow it more extensively.

SUNFLOWERS.

The local market for sunflower seed was very limited until the recent establishment of an oil factory by the British South Africa Co. The encouragement thus given was rapidly manifested when the area planted under this crop in 1915–16 was found to be four times as large as during the previous season. Because of the facilities thus afforded to farmers to dispose of their crop and the fact that sunflowers have been found to be more drought-resistant than other crops produced in Rhodesia, it is expected that a growing number of farmers will cultivate this plant in the future.

Corn planters, with suitable plates, are used to sow the crop. This is usually done in December. The rows are 3 feet apart and the seed is planted in continuous drills 3 to 4 inches apart, from 4 to 10 pounds of seed being sown per acre. When the plants are a few inches high they are thinned to stand 12 to 15 inches in the rows. Sunflowers require from 4 to 5 months to mature. The heads are harvested several days before the seeds are quite ripe, as, if they are fully matured, they are apt to scatter. The yields of Southern Rhodesia range from 800 to 2,000 pounds of cleaned sunflower seed per acre.

There appears to be no really economical method of shelling the sunflower heads. The usual practice in Rhodesia is to use a flail or a rotary wheel. The latter is the most popular, and the rear wheel of a bicycle, turned by means of the pedal crank and the chain, is used for this purpose. The dry heads are held against the rapidly revolving spokes, which thus shell off the seeds. Any satisfactory machine or device to shell sunflower heads is certain to meet with favor in Rhodesia.

The dry stalks of the sunflower are too coarse to have any feeding value, but the heads, when containing the seed and just before ripening, are of considerable value and are often turned into ensilage. Some difficulty is experienced in doing this, however, because unless they are handled with much care they are apt to clog the cutter.

OTHER CROPS.

Wheat and oats are grown in very small quantities. In spite of its limited white population, Southern Rhodesia produces only 15 per cent of the wheat it requires. The country undoubtedly is not favor-

ably situated for the cultivation of these cereals. The chief difficulties are the lack of good spring rains and the fact that the country is too warm.

The growing of Kafir corn would probably prove remunerative but for the havoc caused by small birds. It is expected that eventually a remedy will be found and that this will become a crop of importance.

Beans and potatoes are grown in rather extensive acreages by a small number of farmers. The aggregate importance of these crops is still very small.

Market gardening is engaged in almost exclusively by Italians and Asiatics, who cultivate small plots near the larger cities and towns. Most of the work is done by hand, with the aid of natives. Only occasionally are some of the garden implements in evidence.

Paspalum, Napier's fodder, manna, and other similar grasses are grown in some sections. Alfalfa is seen but seldom, but upward of 25,000 acres of natural grasses are cut every year for hay.

Cotton has so far failed to fulfill the expectations of those who some years ago thought that it would become one of the chief crops of the country. At the present time cotton is not grown anywhere in Southern Rhodesia.

Many farmers in favored sections are taking up the planting of fruit trees, and, while at present the yield is barely sufficient to meet the local demand, it is confidently expected that a considerable fruit export trade will eventually be built up.

LIVE STOCK AND DAIRYING.

Rhodesia is essentially a stock-raising country. Indigenous, native cattle supply the foundation of stock, which is being improved by the introduction of European-bred bulls. The production of forage root crops and hay is increasingly believed to be essential for the success of stock farming. Climatic conditions are such that the cattle run night and day in camps undisturbed and free.

Cattle thrive and are remarkably prolific in Rhodesia. In 1915 there were 394,856 head of cattle in Southern Rhodesia owned by Europeans and 446,070 owned by natives—a total of 840,926, compared with a total of 463,923 in 1911, according to the census taken that year.

There are about half a dozen syndicates in Southern Rhodesia that have in recent years taken up cattle ranching on a very extensive scale with the ultimate purpose of establishing factories for the canning of meat and the manufacture of other beef products. The Liebig's Extract of Meat Co., of London, several years ago acquired more than 1,000,000 acres of land for this purpose.

The production and sale of cream to butter factories is a comparatively new industry in Rhodesia—so much so that the country still imports butter for its small white population. In the last five years, however, the imports of butter and cheese have been reduced by nearly one-half. While dairying will eventually become an important industry, this will be restricted for some time at least to supplying the local demand. Primarily, beef in various forms is to be looked upon as Rhodesia's staple export to the world's markets.

FARM-MACHINERY TRADE.

The imports of agricultural machinery and implements by Southern Rhodesia from all sources in recent years have been as follows: 1908, $93,291; 1911, $162,945; 1912, $168,702; 1913, $260,027; 1914, $213,868; 1915, $123,765. These figures are exclusive of windmills, binding twine, fencing wire, pumps, traction engines, hay presses, and carts and carriages. The share contributed by the United States was $81,047 in 1914 and $48,894 in 1915. The United Kingdom contributed $109,287 and $65,902, respectively.

It will be observed that the United Kingdom supplies a greater amount of farm machinery to Rhodesia than the United States. Two reasons chiefly account for this. As a rule the white population of Rhodesia is composed of British subjects, who, other things being equal, will purchase goods made in the United Kingdom. On the other hand, the extensive use of disk plows and disk harrows in Rhodesia (which machines as turned out by British factories are a good deal stronger and heavier than those produced in the United States) accounts for the fact that American sales of farm machinery in Southern Rhodesia are not relatively as large as those in the Union of South Africa.

Until the beginning of the war, the imports of this class of goods into Rhodesia showed a substantial increase every year. The figures for 1914 and 1915, therefore, can not be taken as representing the imports of normal times. As has been the case everywhere else, farmers in Rhodesia have purchased only what they absolutely needed, and a considerable number of farmers left the country to enlist for the duration of the war. It is hoped, however, that when the war ends the demand for farm machinery will become fairly active.

TYPES OF IMPLEMENTS USED.

In general the remarks made in connection with the types of farm machinery used in the Union of South Africa apply to Rhodesia. Only in a few respects do conditions in Rhodesia differ.

Disk plows are more often used in Rhodesia than moldboard plows. Probably 75 per cent of the plowing there is done with disk plows. Three or four furrow disk plows are chiefly used. These are of the heavier types sold in South Africa and supplied by British firms.

In the aggregate a large number of heavy gang plows are also used, which in the great majority of cases are purchased with the third bottom attachment.

With the Rhodesian natives a fairly large trade is done in American chilled walking plows. The European farmers who use single-furrow plows generally purchase the heavier types supplied by American and English manufacturers.

Disk harrows are seen on nearly every farm. The type most in favor is that manufactured by English firms.

Almost without exception, the corn growers of Rhodesia use the American type of two-row corn planter, which, as a rule, is equipped with fertilizer attachment. Two, three, or four two-row planters are often worked in tandem, and various American manufacturers supply suitable forecarriages for this purpose, although in many cases these tandem forecarriages are manufactured locally. The de-

mand for either three-row corn drills or single-row planters is very small. The latter, however, are sold in increasing quantities to the natives.

The adoption of the arch cultivator has made greater strides among Rhodesian farmers than among the farmers of the Union. Disk cultivators and other standard types of arch shovel cultivators are sold in Rhodesia in increasing numbers. The demand for this class of goods is certain to improve from year to year.

The extensive employment of natives in farm work operates against the regular use of corn binders or corn pickers. It is likely, however, that Rhodesia will eventually prove an easier market in which to sell these machines than any other section of South Africa. Generally speaking, Rhodesian farmers cultivate larger acreages of corn than their southern neighbors, and when they are shown that corn binders will more economically and expeditiously harvest corn, an active demand for these machines is likely to be rapidly established. A suitable machine to cut whole corn stalks at the base without cutting them into small pieces would be certain to interest a good many farmers of that country.

In connection with the extensive ranching operations carried on in several parts of Rhodesia, a good many mowers and rakes are sold. These machines are used to cut the natural grasses to provide feed for the cattle when the pastures are deficient because of inadequate rainfall.

A good many corn shellers are sold in Rhodesia. Shellers for individual use are sold extensively, as well as a good number of the large outfits supplied by British firms. The country offers relatively good possibilities for the sale of corn-shelling machinery.

As indicated in the report covering the Union of South Africa, steel trucks are in increasing demand in Rhodesia, and the possibilities of that market for this class of goods deserves the attention of American manufacturers.

TRADE METHODS AND OUTLOOK.

There are several direct importers of farm machinery in Southern Rhodesia. In a few cases such goods are sold by branches of firms in the Union of South Africa, whereas in others a large business is done by firms acting as agents for farm-machinery importers in the Union, this latter method of doing business being rather preferred because of the uncertainty always confronting Rhodesian merchants as to the probable demand for this class of goods.

It is felt that the information herein given regarding the agricultural outlook of Southern Rhodesia and the present demand for farm machinery will enable American farm-machinery manufacturers to appreciate that the country, in itself, does not offer at this time any particular inducement warranting special efforts to increase their business. The trade of Rhodesia must, for many years, remain closely associated with that of the Union of South Africa. Representatives of American firms in South Africa should visit Rhodesia about once every year, and those who may make only a periodical tour of South Africa will do well to ascertain by correspondence the advisability of including that territory in their itinerary.

NORTHERN RHODESIA.

Since 1899 the various territories now known as Northern Rhodesia have been administered by the British South Africa Co. The territory embraces an area of 290,000 square miles, and in 1911 it had a population of 1,427 Europeans and about 800,000 natives. The present white population is estimated at about 2,000, giving a proportion of 400 natives to every white person in the country.

CLIMATE AND RAINFALL.

Northern Rhodesia, for the greater part, is a continuation of the high South African plateau, which extends from the Karroo, in Cape Province, through Southern Rhodesia, to the north of the Zambezi. The altitude of the farming country varies from 3,000 to 4,000 feet.

As regards its climate, it may be said that its altitude makes up for its proximity to the Equator. The country along the railway line is for the most part higher than the Zambezi Valley and is proportionately more healthful and suitable for European settlement. The climate, however, is open to objection on the score of infectious diseases, but those who take suitable precautions have little to fear. Good living and good housing are the two chief necessities, as well as suitable protection by netting and proper drainage. The rainfall varies from 25 to 50 inches. It increases toward the eastern districts, where it is adequate for all agricultural purposes. To the west the rainfall becomes much smaller, as is the case in the western districts of Southern Rhodesia and the Union of South Africa. Northern Rhodesia, however, is more favored in respect to rainfall than is Southern Rhodesia.

TRADING CENTERS.

Livingstone, with a European population of 400, is the largest town in Northern Rhodesia and the seat of administration. Along the railway line to the Kongo border are a number of very small towns, such as Kafue and Broken Hill, where some trading is also done. In the northeast, about 260 miles from the railway head, Fort Jameson is the only town of any importance.

IMPORTS AND EXPORTS.

The imports into Northern Rhodesia amounted to $705,880 in 1911 and $745,480 in 1915, and the exports to $523,430 and $586,501, respectively. The principal imports are flour, furniture, fencing wire, hardware, bicycles, and agricultural and mining machinery, and the exports consist chiefly of cattle, corn, hides and skins, tobacco, ivory, cotton, and horns. Imports from the United States amounted to $20,006 in 1915. No figures giving the exports to this country are available.

MINERAL RESOURCES.

The territory is said to have considerable mineral deposits. Copper is known to exist in great quantities. Nitrates, saltpeter, and lime are also mined. Owing to the fact that general prospecting has been possible only since the promulgation of a law that went into

effect in April, 1911, little is definitely known concerning the mining possibilities. Copper is already being mined in different sections, the deposits at Bwana M'Kubwa and in the region of the Kafue River being of great richness and enormous extent. A large deposit of lead and zinc is also being developed at Broken Hill.

RAILWAY AND OTHER TRANSPORTATION.

With the exception of the railway from Livingstone to the Kongo border, Northern Rhodesia has no railways. Oxen transportation is resorted to extensively, but owing to the presence of the tsetse fly many rich farming sections can not be reached at all by that means. The use of the motor car and motor truck will probably be adopted in these places, but the high cost of fuel in these remote parts of Africa will prove a disadvantage.

DEVELOPMENT PROSPECTS.

The territory under the control of the British South Africa Co. is so enormous in extent that it has been intimated lately that the policy of that company is to discourage the settlement of Northern Rhodesia whenever the intending settlers can be persuaded to settle in Southern Rhodesia. The project to establish one administration for both Southern and Northern Rhodesia, with headquarters at Salisbury, is an indication that the alleged policy may be definitely adopted. As long as no better inducements can be offered to attract settlers in large numbers, it might be preferable to work toward concentration in Southern Rhodesia instead of allowing the entire country to become thinly populated with the result that the settlers in the more remote parts will be handicapped with inadequate transportation, education, and other necessary facilities.

AGRICULTURAL DEVELOPMENT.

Northern Rhodesia offers splendid prospects in connection with farming. The land is extremely fertile, and it will produce crops of all kinds. Mixed farming, consisting of cattle and pig breeding and corn and citrus-fruit growing, seems to be the goal of those who have taken up farming there. Cotton and tobacco also offer promising prospects in various districts. For the growing of fiber-yielding plants, Northern Rhodesia is excellently well suited, but, as is the case with farming in general, the success and the growth of this industry depend on the cost and facilities of transportation to seaport and thence to the over-sea markets.

LAND SETTLEMENT—LABOR.

No statistics are available regarding the area of land so far taken up for agricultural and pastoral purposes. In all probability, however, 1,000,000 acres have been taken up thus far by European farmers, of which possibly less than 25,000 acres have been placed under cultivation. The number of farmers in Northern Rhodesia probably does not exceed 150. The farms are generally of from 2,000 to 4,000 acres, and the price of land ranges from $0.65 to $2 per acre, according to soil and situation.

MANNER OF ACQUIRING LAND.

Land is granted under a permit of occupation covering a period of 5 years, which may be extended to 10 years. The annual rent is 6 per cent of the purchase price. No rent is collected until the end of the second year, when the second year's rent and one-quarter of the first year's rent become due. Thereafter one-quarter of the first year's rent falls due annually, so that the annual payments for the second, third, fourth, and fifth years consist of one year's rent plus one-quarter of the first year's rent. The tenant may at any time during the first or second term of 5 years pay the purchase price, or make payments on account by half-yearly installments of not less than one-tenth of the purchase price, thereby reducing the annual rent. At the end of the 5 or 10 years, the purchase price having been paid and the occupation conditions satisfactorily fulfilled, the tenant is granted final title. Thereafter there is an annual quitrent of $0.25 for every 50 acres.

CHIEF FARMING AREAS.

The best farming areas in Northern Rhodesia are situated along and in the vicinity of the railway line between Livingstone and Mwemboshi. Farther north there are also large areas of territory with well-watered and rich soil, but they are infested with tsetse fly. It is believed that dependence will have to be placed on steam and motor driven implements to develop that territory agriculturally, since oxen can not be used for such purposes on account of the tsetse fly.

Kafue is the chief farming center of Northern Rhodesia. Within a radius of 50 miles of that town, all the elements necessary to successful farming are present. North of Kafue the presence of the tsetse fly often operates against the utilization of the land for farming. South of the farming belt indicated, the soil is relatively poor and the rainfall inadequate, which is also the case west of Kafue. Cotton has been grown in the Kafue districts with satisfactory results for a number of years, but the industry is not making rapid progress, doubtless because of the difficulties of settlement. In time cotton should constitute one of the leading crops of Northern Rhodesia. The farmers in the Kafue district at present are chiefly engaged in cattle raising and corn growing.

In northeastern Rhodesia the farming area is limited at present, owing to the present of the tsetse fly. The country suitable for this purpose is practically confined to the sections in the neighborhood of Fort Jameson and the Tanganyika Plateau. Seventy-five farms have so far been taken up there. About 5,000 acres have already been planted with cotton, and in the season of 1915 about 500,000 pounds of tobacco were reaped in the Fort Jameson district. Stock raising has proved successful, and several thousand head of cattle have already been shipped to Southern Rhodesia. The chief difficulty on the Tanganyika Plateau, and to a less extent in the Fort Jameson district, is the transport question. Fort Jameson is 230 miles from Tete, a river port on the Zambesi, and 260 miles from Blantyre, the nearest railway head. The movement of cattle (at present the only means of transportation) is attended with great risks, travel through tsetse-fly-infested regions being often unavoidable.

PRINCIPAL DIFFICULTIES.

The ravages of the tsetse fly and the inadequate transportation facilities are the chief deterring factors in connection with the agricultural progress of Northern Rhodesia. Scientists have some knowledge of the breeding habits of the fly and the way in which it carries disease, but have as yet found no method of controlling its spread and no certain cure for the disease it conveys. It is believed, however, that the presence of big game operates against freeing the country of the fly. Experiments are now being made to fence a large area of land and exterminate the game within that fence. If these experiments prove a success, one of the chief drawbacks will have been eliminated. It must be noted that the tsetse fly has occasionally been found to be a carrier of disease to man, and sleeping sickness is certainly a disease to guard against.

Farming in Northern Rhodesia at the present time presents a great many difficulties to the small settler. The country, however, offers many inducements to large companies with capital sufficient to make possible the use of mechanical means of working the soil, as well as for the transportation of the crops to the railway. The supply of labor is ample. Wages for ordinary native labor vary from $2 to $4 per month; drivers are paid from $10 to $20 per month. The administration has announced that after the war the native's hut tax will be increased to $2.50, which, it is expected, will cause a greater number of natives to offer themselves for farm work.

STOCK RAISING.

Cattle raising has achieved considerable success in the different sections of Northern Rhodesia that have proved immune to the tsetse fly. With the admixture of imported breeding stock very fine herds are coming to maturity. A good many valuable shipments of slaughter cattle, as well as corn, are already being made to the Belgian Kongo to supply the needs of the increasing and well-paid white and native population employed in the enormously rich copper mines of the Katanga district. The total white population of that district was 747 in 1911, 1,760 in 1912, and 2,500 in 1913, which is an index of the rapid progress of mining there and of the increasing demand for produce from Rhodesia. Slaughter cattle are also shipped in increasing quantities to Bulawayo and Johannesburg.

FARM-MACHINERY TRADE.

The declared imports of agricultural machinery and implements into Northern Rhodesia are unimportant in value. Since the opening up of the country these have never exceeded $25,000 per annum. This is indicative of the present small importance of Northern Rhodesia as regards the farm-machinery business. It is not improbable, however, that a number of farm machines are shipped to that territory from Southern Rhodesia, which are not included in the import returns. The fact must be considered that whatever agricultural work is done in the sections of Northern Rhodesia that are not reached by railways is done with the use of hand labor exclusively, without even oxen-drawn implements. Oxen can not be used there because of the presence of the tsetse fly. This pest will, no doubt, retreat as settlement advances. The advent of the small tractor

should make possible considerable agricultural development, as its employment would make farmers independent of oxen for draft purposes. If the country should attract large numbers of farmers after the war, manufacturers of small farm tractors might be justified in making efforts to introduce their machines in Northern Rhodesia. The number of farmers now in that country would hardly warrant such action at present.

Northern Rhodesian farmers have moved thither either from the Union of South Africa or Southern Rhodesia. It follows, therefore, that in the great majority of cases, when implements are used, these are of the types most in vogue in the countries in which the owners formerly farmed. As already indicated, corn is the principal cultivated crop, which is grown as in other parts of South Africa. As in Southern Rhodesia, disk plows appear to be in greater favor than moldboard plows.

Livingstone is the only town in which stocks of implements are carried. In the majority of cases the houses there are branches of Southern Rhodesia firms, although in one or two cases goods are imported direct by merchants in that town. The demand is so very small that it will not be necessary, for many years to come, for representatives of American manufacturers of farm machinery to visit Northern Rhodesia.

VIII. PORTUGUESE EAST AFRICA.

Portuguese East Africa extends through 16 degrees of latitude from 11° to 27° south. The area of the country is 293,000 square miles, and its coast line is more than 1,000 miles long. The population is estimated at about 18,000 whites and 3,120,000 natives. The majority of whites are of Portuguese stock. In Lourenço Marques there are 700 British subjects and in Beira about 250. Before the present war a relatively large number of Germans resided in the country. Small traders are mostly British Indians, there being probably 2,000 persons of that nationality in the country.

POLITICAL DIVISIONS.

The country is a Portuguese colony composed of three distinct entities—(1) the province of Mozambique, (2) the Companhia de Mozambique's territory, and (3) the Companhia do Nyassa's territory. The two companies mentioned hold charters from the Portuguese Government, and the administration of their respective territories is entirely separate from, and independent in every respect of, the province of Mozambique. The province of Mozambique is administered by a governor general, who is appointed by the Portuguese Government and is assisted by a colonial council. The two chartered companies appoint their own governors, subject to the approval of the Portuguese Government.

There are a number of companies in Portuguese East Africa to which large concessions of land have been made and which could almost be called subcharter companies. These are locally designated as "prazos" (large agricultural estates), in which the natives cultivate various crops for the benefit of the European leaseholders, who also act as tax collectors and can claim the taxes either in labor or in produce. The Companhia de Zambesia, the Companhia do Boror, and the Société du Madal are among the most important companies under this category.

The word "Mozambique" in connection with Portuguese East Africa occurs in five different and separate designations, as follows: (1) The province of Mozambique, the official name of one of the three political entities of Portuguese East Africa; (2) the Mozambique Co.'s territory, the official name of another of the three entities; (3) the district of Mozambique, equivalent to a "county," which is a part of the fiscal territory of the province of Mozambique, of which (4) the town of Mozambique is the capital; and (5) the word "Mozambique" is used by some writers when referring to Portuguese East Africa as a whole.

LANGUAGE, CURRENCY, WEIGHTS, AND MEASURES.

Portuguese is the official language of the country, but owing to the large influx of British subjects in the principal cities English is widely understood. The importation of farm machinery is chiefly

in the hands of British firms. The escudo (the new name of the Portuguese milreis) is nominally equivalent to $1.08 United States currency. The actual average value of the paper currency for the year 1914 was $0.86. In this report the official rate of $1.08 to the escudo has been used in making conversions of foreign-trade statistics. English currency is legal tender throughout Portuguese East Africa. Not only is the bulk of business done in terms of English gold but the provincial revenue from hut taxes, labor emigration, and customs duties is collected in gold. The metric system is in vogue, but in connection with the sale of farm machinery there is no need of altering the specifications used in the United States.

PHYSICAL FEATURES.

Portuguese East Africa abounds in well-watered, alluvial plains favored with both a tropical and semitropical climate, making it a country of great and varied possibilities.

The coast lands are very low and swampy, having for this reason little economic value. Malarial fever and other tropical diseases are prevalent along most of the coast, except Lourenço Marques and Beira, in which cities much has been done to make them healthful for European settlers. These swampy lands, however, are seldom of great width. North of the Zambezi the country rises rapidly toward the west. In the south the ascent is more gradual. When the high altitudes are reached there is nothing that should deter European settlers, if only common-sense sanitary precautions are taken.

The opinion prevails abroad that Portuguese East Africa is a country in which fever is rampant and which is generally unhealthful for the white race. It would be erroneous to include the entire country under that category, for even in the low-lying country and in the marshy districts conditions are not as unsatisfactory as is generally believed. Fever is yearly diminishing as proper drainage is adopted and the settlers recognize the value of good cover at night and of proper living.

Portuguese East Africa is endowed with a wonderful river system. The whole of the great plateau of central and South Africa, east of the divide that separates the Kongo and the Zambezi, is drained into that country. These rivers are not torrential but flow slowly through valleys that they have themselves built up with the large alluvial deposits borne upon their waters. There are several navigable rivers in Portuguese East Africa, which, considering the limited width of the country, constitute an economic asset of great importance. The Zambezi, Shire, Buzi, and other rivers are navigable for many miles.

CHIEF PORTS.

The principal ports of Portuguese East Africa are Lourenço Marques, Beira, Ibo, Porto Amelia, Mozambique, Quelimane, Chinde, and Inhambane. The country is served by several steamship lines operating around the Cape of Good Hope, which by so doing avoid paying the heavy tolls of the Suez Canal. Portuguese East Africa's coast contains the natural ports for the Transvaal, Southern and Northern Rhodesia, British Nyassaland, and the vast region centering on Lake Nyassa.

RAILWAYS.

The Delagoa Bay Railway, 57 miles in length, connects Lourenço Marques, or Delagoa Bay, as its port is called, with Pretoria. The Beira Railway, 204 miles long, connects Beira with the Rhodesian border, where at Umtali it joins the main Rhodesian line. A line from Chai Chai, near the mouth of the Limpopo River, to Nanjacasi has 32 miles in operation, and that from Mutamba to Inharrime 25 miles. The construction of the line from Lourenço Marques to the Swaziland border, 47 miles in length, which is to meet the Breyten extension from Johannesburg and which is built to shorten the railway from Delagoa Bay to Johannesburg by 60 miles, has been completed. The work on the Transvaal section, however, is still in abeyance. A line is projected from Beira northward to Port Herald in Nyassaland.

PROVINCE OF MOZAMBIQUE.

The province of Mozambique has an area of about 160,000 square miles and a population of 16,000 whites, 2,000 Asiatics, and more than 1,000,000 natives. Its capital and chief trading center is Lourenço Marques, with a population of 6,000 whites. The harbor of this port is regarded as the best in South Africa, being 25 miles long and 22 miles broad.

This province is divided into five different districts, namely, Lourenço Marques and Inhambane in the south, and Quelimane, Tete, and Mozambique in the north, situated between the Mozambique Co. and the Nyassa Co. territories. In other words, the province is separated into two parts, the territory of the Mozambique Co. lying between its two southern and three northern districts.

MINERAL RESOURCES.

There are immense coal deposits in the neighborhood of Tete and near Lourenço Marques, and adjoining the coal fields ironstone of the best quality is plentiful. Malachite and copper are found in certain parts of the interior. The whole of the region north of Lourenço Marques as far as the Zambezi and inland to and beyond the Portuguese frontier is auriferous.

ECONOMIC DEVELOPMENT.

American Consul George A. Chamberlain, of Lourenço Marques, aptly describes the economic position of the province of Mozambique and the limited development of its industries when he says: "The prosperity of commerce throughout the province in general depends almost entirely on the buying power of the native, and his buying power is derived almost exclusively from money earned in the Johannesburg mines, in its total a large sum, which, in spite of the war, continues to increase."

In 1914 all imports into the province of Mozambique, through its several ports, reached the sum of $8,609,124 and the exports, including domestic and foreign nationalized products, $2,197,527. Of the imports $305,381 worth were supplied by the United States, of which

$56,587 represented machinery of several kinds, including agricultural machinery. This indicates the limited advance made by the agricultural industry of the country and the unimportance of this market for American manufacturers of farm machinery. However, English and Dutch farmers near the Transvaal border frequently purchase their machinery from salesmen representing firms in Pretoria or Johannesburg.

The exports of local produce in 1914 were valued at $1,942,684, contributed by the various districts as follows: Lourenço Marques, $482,900; Inhambane, $448,872; Quelimane, $219,874 through the port of Chinde and $405,518 through the port of Quelimane; Mozambique, $385,515.

LOURENÇO MARQUES DISTRICT.

The trade of the port of Lourenço Marques is almost confined to the requirements of the town itself, the distribution of Kafir truck, and the transit trade of the Transvaal, of which it is the natural port. The interior of this vast district is in great measure undeveloped. Lourenço Marques is the principal receiving station for native labor recruited for the Transvaal mines. Commercial activities in that city are largely controlled by British firms.

The rainfall averages 27 inches in the town of Lourenço Marques. The district, on the whole, is well watered and it has also enormous expanses of most fertile soil. The chief exports of produce from this district, in 1914, were as follows: Beans, $62,726; hides and skins, $17,235; peanuts, $63,687; whale oil, $28,908; and sugar, $256,449. As these figures indicate, very little agricultural progress has been made so far. Sugar growing, however, is making rapid strides. The district is well suited for the cultivation of many and varied crops. The cultivation of corn, fruit, and alfalfa offers promising prospects.

INHAMBANE DISTRICT.

At Inhambane the rainfall ranges from 27 to 63 inches. The northern part of this district is almost destitute of rivers, but it has a greater rainfall than the southern sections. A very fertile strip of land about 50 miles in width borders the coast of the Inhambane district. Many dry valleys, where black alluvial soil has accumulated for centuries, are found there. This district's chief exports of produce in 1914 were as follows: Copra, $25,254; fertilizer, whale, $31,836; mafureira (oil seed), $26,579; peanuts, $66,852; whale oil, $234,917; sugar, $39,696.

QUELIMANE DISTRICT.

Quelimane is called the "garden of the coast." It has a greater rainfall than any other section of Portuguese East Africa, and it is a land of many rivers and mountains. The rainfall in some sections is as high as 70 inches. Through the port of Chinde this district exported in 1914 the following produce: Raw cotton, $21,528; peanuts, $28,351; sugar, $93,667; and wax, $30,398. Through the port of Quelimane the exports were: Agave, $60,300; copper, $264,333; peanuts, $44,270; and sugar, $23,597.

TETE DISTRICT.

Tete has the reputation of being a dry and rocky country. It is remote from the coast, and farmers are not likely to take an interest in the district until they are crowded out of the fertile regions nearer the sea and civilization.

MOZAMBIQUE DISTRICT.

The district of Mozambique has a rainfall of 20 inches along the coast, which increases to probably 70 inches in the highlands. The country is intersected with numerous rivers and streams. Some of the natives in this district were hostile to Europeans until a few years ago, and the country can scarcely be said to have been open for settlement, though the Portuguese by peaceful penetration have gradually established their outposts farther inland. The present population of the Mozambique district is 570 whites, 550 Asiatics, and something over 500,000 natives. The produce exported by this district in 1914 was as follows: Indian corn, $98,400; Kafir beans, $29,026; Kafir corn, $28,329; mangrove bark, $22,080; peanuts, $142,544; sesame, $24,082.

DEVELOPMENT OF AGRICULTURE.

With the exception of sugar-cane cultivation, agricultural conditions in the province of Mozambique are even to-day exceedingly backward. The agricultural exports of the province have been very small so far. There are no statistics available concerning the acreage under cultivation and the number of farmers who have taken up land there. If these figures were obtainable it would doubtless be found that very little agricultural work has been done by white farmers up to the present time. Whatever agricultural development has taken place is due to the natives, who use the most primitive methods in tilling and cultivating the land.

Signs of improvement have been discerned in the past few years, and undoubtedly the country is endowed with many of the necessary advantages to become a great and rich agricultural producer. The rainfall is usually ample and the soil most fertile and productive when properly cultivated.

Some large blocks of land have been taken up during the last three years in the Umbeluzi Valley for cattle raising on a large scale, and the Government's experimental farm at Umbeluzi has been importing pedigreed stock, which is loaned to farmers for breeding purposes.

During 1915 approximately 1,500 oxen were imported into the southern districts from the Union of South Africa for slaughtering purposes. In view of the enormous extent of the grazing lands of the province, estimated at many millions of acres, it is regrettable that it should be still necessary to import slaughter oxen. This indicates what little progress has been made even in the pastoral development of the country.

PRINCIPAL CROPS GROWN.

As the export figures indicate, little effort has so far been made in the cultivation of crops by Europeans; therefore, the following infor-

mation should be taken only as indicating the chief crops for which the country is suitable.

The province of Mozambique is advantageously situated for the production of maize. It has an ample rainfall during the growing season, as well as a favorable season for harvesting.

The cultivation of sisal hemp offers great possibilities, and in the districts of Lourenço Marques, Inhambane, and Quelimane a start is being made with this crop.

Along the Incomati River in the Lourenço Marques district a good deal of progress has been made in recent years in connection with sugar growing. The Incomati Sugar Estates (Ltd.) started crushing in 1914, and several thousand tons of sugar are already produced annually. In the district of Quelimane, on the northern banks of the Zambezi, sugar is also produced in increasing quantities.

Tobacco is grown in the Umbeluzi Valley, near Lourenço Marques, and in the districts of Quelimane, Tete, and Inhambane. The production so far has barely sufficed to supply the local demand for cigarette manufacture. The wide range of soils and climate provides opportunity for growing a large number of tobacco varieties.

Cotton has been successfully grown in small quantities in the Quelimane and Mozambique districts. When the transportation difficulties are overcome, and as the country becomes more actively developed, cotton will undoubtedly become one of the most extensively grown crops.

It is estimated that there are 2,500,000 acres of Landolphia rubber forest in the province of Mozambique, carrying rubber worth at least $150 per acre. The expense and difficulties at present attached to gathering the rubber and the low prices prevailing in the European markets have so far prevented the working of these forests on an extensive scale.

The production of copra, obtainable from coconuts, is relatively an important industry. The district of Quelimane leads all others in the output of copra, having 2,500,000 coconut trees.

Oil seeds, such as peanuts, sesame, and mafureira (*Trichilla emetica*) are produced throughout the territory and constitute important items of export. The present difficulties and cost of harvesting and the inadequate means of transportation militate against increased production.

FARM-MACHINERY TRADE.

Figures are not available upon which to review the extent of the use and importation of farm machinery into the province of Mozambique. The imports of farm machinery are merged with those of industrial and other machinery. The imports of machinery of all classes through the port of Lourenço Marques amounted to $226,655 in 1914, to which the United States contributed $56,587. The imports of machinery of all kinds from the United States in 1914 through the other ports were as follows: Inhambane, $6,120; Quelimane, $2,456; Mozambique, $348. The other ports of this Province do not show that machinery of any kind was imported from the United States during that year.

These figures indicate that the imports of farm machinery at the present time must be exceedingly small. Through the port of Lourenço Marques a relatively large number of farm machines are undoubtedly imported, but these, in many cases, are for reshipment to

the eastern districts of the Transvaal, which on account of their proximity to Lourenço Marques constitute a field of activity for the merchants located in that city.

The European farmers located in the district of Lourenço Marques, for the most part, have gone there from other sections of South Africa. When farm machines are used, therefore, these are usually such as are in vogue in the Union.

In time the province of Mozambique ought to prove a good field for the sale of farm machinery. Its agricultural potentialities are too great to be much longer neglected, and even now a great deal of interest is being manifested in the devising of ways and means to foster their rapid development. An upward movement in the use of farm machinery should be discernible from now on.

MOZAMBIQUE CO.'S TERRITORY.

The territory of the Companhia de Mozambique extends from the Zambezi River in the north to 22° in the south. Its western boundary is Rhodesia. It covers an area of about 65,000 square miles. Its charter from the Portuguese Government empowers the company to administer the country for 50 years from May 17, 1897. The administration is vested in a Governor appointed by the company and approved by the Portuguese Government. Its Board of Directors is located at Lisbon, and committees are maintained at London and Paris. There were 287,601 persons in the territory in 1914, of whom 2,051 were whites, 1,025 Asiatics, 1,543 half-caste, and 282,982 negroes.

Beira is the headquarters of the administration and the chief trading center; it has a population of 9,419, of whom 1,197 are whites. It is also the natural port of entry for Rhodesia and the southern districts of the Kongo. The construction of the railway from that city to Umtali, on the Rhodesian border, in 1896 marks the beginning of its development and that of its rich hinterland.

RAINFALL.

The average rainfall in the farming districts is about 50 inches; it is greater along the coast. Along the Zambezi River the rainfall varies from 25 to 50 inches, decreasing as the river is ascended. The entire country is well watered and is not subject to droughts. The rainfall from November to April, the maize-growing season, averages 38 inches. For the other six months the average rainfall is sometimes less than 5 inches. January and February are the wettest months. Such an abundant rainfall during the early stages of the crop often prevents proper cultivation and encourages the early growth of weeds. Near Beira the rainfall averages 57 inches. March is the wettest month, with an average of 16 inches.

FOREIGN TRADE.

The imports and exports for the years 1913, 1914, and 1915 were as follows:

Trade.	1913	1914	1915
Imports	$3,049,181	$2,229,765	$1,872,818
Exports	2,704,899	2,569,114	2,096,362

The imports are chiefly cotton goods, grain bags, railway material, oils, spirits, agricultural and industrial machinery, wearing apparel, and iron and steel. The principal exports in 1914 were: Sugar, $1,280,468; gold bars, $317,537; corn, $232,417; peanuts, $42,000; mangrove bark, $34,540; and raw cotton, $20,683. The quantity of sugar exported in 1915 was about 35,000 tons, nearly twice the quantity shipped in 1911. The exports of corn in 1915 were about 200,000 bags, nearly four times as much as in 1911.

The imports from the United States in recent years have been as follows: 1913, $292,622; 1914, $175,317; 1915, $213,512. Machinery, lumber, iron and steel, flour, and oils are the principal articles imported.

TRADE PROSPECTS.

The decline in trade during the years 1914 and 1915 is to be attributed solely to the effects of the war. The withdrawal of German shipping, which in normal times was nearly equal in tonnage to that of Great Britain, is one of the chief reasons why the trade has not been maintained at the same high level since the war started. The country possesses great economic prospects, and with the efforts of the government to develop its resources the trade should show considerable increases when normal conditions again prevail.

By comparing the trade of the Mozambique Co.'s territory with that of the other sections of Portuguese East Africa, it will be seen that this territory is much the largest producer of agricultural products. Its premier position in this respect is enhanced by the fact of the small area it occupies.

MINING.

Mining in the Mozambique Co.'s territory is not as important a factor in the development of its resources as is the case in other parts of South Africa. The district of Macequece, however, is well known as a mining center, being rich in reef and alluvial gold. The exports of gold bars in 1914 were valued at $317,537. This industry has shown a steady advance since its inception, and considerable mining wealth undoubtedly remains to be developed.

DEVELOPMENT OF AGRICULTURE.

Agriculture is without doubt the mainstay of the territory and destined during the next few years to assume enormous proportions. Owing to the rich soil, abundant rainfall, and favorable climate, a number of tropical and subtropical products can be successfully cultivated. The principal crops grown by Europeans are maize, sugar cane, and coconuts. The natives produce increasing quantities of cotton, maize, millet, beans, peanuts, rice, and tobacco.

The development of agriculture is undoubtedly the chief aim of the Mozambique Co. Thanks to its energetic and sympathetic policy, the exports of farm produce are already important and varied. The interest and system with which the company fosters this development are almost unapproached in any other section of South Africa. Very intelligent regulations have been enacted to prevent holding up the land for speculative purposes. A certain acreage under cultivation and the keeping of a number of cattle are necessary requisites before the land can be purchased. Provided these regulations

are observed, very good land can still be obtained at very low prices on liberal terms of payment.

To stimulate agriculture the government has arranged for farmers to pay 50 per cent of the cost of native labor employed, after the harvest; seeds are also supplied to be paid for at that time. Cattle to improve the herds, or for draft purposes, are sold by the government to be paid for in 6, 9, and 12 months installments. The supplying of bulls for breeding purposes and advances for the erection of dipping tanks are other facilities extended to farmers. Natives for agricultural work are paid about $4.50 each per month. The supply is plentiful and efficient. The company maintains a department of agriculture and two experimental farms. The well-qualified officials of these institutions pay numerous visits to the agricultural centers, advising farmers concerning the best methods of cultivating their crops.

Contrary to the experience of farmers in certain other parts of South Africa, those who have taken up agriculture in this territory appear to be thoroughly contented and doing exceedingly well. Many cases of almost astonishing success are known. Farmers who started five years ago with a capital of $500 are reputed to be worth to-day $3,000 or more.

The principal farming centers and their altitudes are: Bandula, 2,395 feet; Vanduzi, 2,096 feet; Chimoio, 2,229 feet; Mandegos, 2,303 feet; Gondola, 2,030 feet; Siluvu Hills, 452 feet; Villa Machado, 182 feet; and Muda, 36 feet. All these centers are well served by railway stations and sidings, with post and telegraph offices always handy.

AREA OF LAND CULTIVATED.

In 1910 (exclusive of sugar cane) there were 11,600 acres of land cultivated by 85 white farmers. In 1914 the acreage under cultivation was 37,500 acres and the number of farmers 210. There are, in addition, many thousands of acres cultivated by the natives, who, on the whole, appear to be more industrious and thrifty than the natives of other sections of South Africa. The land on both sides of the Beira-Rhodesia Railway line is divided into blocks belonging alternately to the Mozambique Co. and the Beira Railway.

The following figures show the progressive development of the territory in connection with the leasing of land for development:

Years.	On temporary lease.	On perpetual lease.
	Acres.	*Acres.*
1911	90,348	45,295
1912	103,500	33,610
1913	226,005	67,500
1914	186,477	68,570
1915 (to Sept. 30)	73,965	39,971

ACQUISITION OF LAND.

According to its charter the Mozambique Co. is the owner of all lands, subject to the condition that all titles issued shall state that a quitrent of 10 reis (about 1 cent) per hectare (2.471 acres) shall

be payable to the State per annum at the termination of the charter. Land is leased for two years at an annual rental of about 2 cents per hectare, with the understanding that 5 per cent of the area is brought under cultivation. When this condition is fulfilled land can be secured on the basis of perpetual lease at an annual rental fixed upon the lease title. Land can be obtained as freehold upon payment of a sum equal to 20 years' annual rent. The usual size of a farm is 1,000 hectares (2,471 acres).

AGRICULTURE ON THE ZAMBEZI.

Agriculture on the Zambezi River (which crosses Portuguese East Africa for nearly 600 miles and forms the boundaries of the Mozambique Co.'s territory and that of the northern districts of the province of Mozambique), as well as its tributary, the Shire River, is and will be preeminently associated with sugar-cane growing, which industry is capable of considerable development owing to the rich alluvial deposits along the banks and the extensive facilities for irrigation. Cotton and tobacco also offer great possibilities. Corn, sisal, rubber, rice, peanuts, and coffee may also be expected to claim a place among the products. At the present time, however, the country the river traverses is not altogether suitable for small settlers, unless grouped together in one fertile locality and cooperating in the employment of labor-saving machinery and the establishment of central factories. It is essentially a country for the capitalist and for traction plowing. The latent resources are enormous, but judgment and discrimination should be exercised in the selection of land, the choice and cultivation of crops, and in obtaining adequate labor supplies.

The Zambezi is navigable, for light-draft steamers, from January to June for a considerable distance. There is no difficulty in reaching Tete during that season, and even Feira, on the Rhodesian border. During dry seasons, however, the river falls rapidly and navigation becomes a tedious business. East of Mutarara none of the Zambezi tributaries are navigable with the exception of the Shire. Light steamers can reach Port Herald in the wet season and Villa Bocage throughout the year. Chinde is the port of shipment for the produce of the Zambezi district going to over-sea countries.

PRINCIPAL CROPS GROWN.

CORN.

Corn may be considered the staple product of the territory, and it is already the means of livelihood of a large number of Europeans. The deep, rich red and chocolate soils of Chimoio and Manica produce some of the finest "white flat" maize in South Africa. Yields of 35 bags of 200 pounds each per acre have often been harvested, and on well-cultivated farms the average is 15 bags per acre. The rainfall is good during the growing season, while the dry winter months are suited for drying and shelling the maize in the open. The acreage under corn was 21,177 in 1913, 24,655 in 1914, and 33,222 in 1915. After providing for the needs of its population, which are estimated at 50,000 bags per annum, the territory exports at present about 200,000 bags of corn.

SUGAR.

The value of the exports of sugar far exceeds that of any other product. Many sections of the territory are exceedingly well adapted for the cultivation of sugar cane, and in this industry there is room for almost unlimited expansion. At the present time sugar cane is grown only on the alluvial flats of the Zambezi and Buzi Rivers, but it is not improbable that before long factories will be erected on the upper reaches of the Buzi River and also along the Pungwe River. Three large mills on the Zambezi and two on the lower Buzi produced about 50,000 tons of sugar in 1915. The area under cultivation in the lands adjoining these mills is steadily increasing. The Illobo Sugar Co. increased its acreage from 800 in 1911 to 8,000 in 1915.

COTTON.

A good beginning has been made in the cultivation of cotton, which bids fair to become one of the most lucrative and solid industries of the territory. Ninety-five per cent of the cotton is grown around Chemba, in the Sena district, where there are enormous expanses of most excellent and suitable land. All cotton is grown by natives under the supervision of the official chief of the district. The natives are given the seed, and the crop is purchased by the Mozambique Co. at a fixed price. The yields average 350 pounds of seed cotton per acre, the percentage of lint being 30 per cent. The 1915 crop yielded 320 tons of seed cotton. The Mozambique Co. has under consideration plans for the development of the cotton-growing industry on an extensive scale. An up-to-date ginnery, costing $60,000, was erected some time ago at Chemba.

OTHER CROPS.

Mangrove bark suitable for tanning purposes is one of the chief products of the territory. In 1910, 2,200 tons were exported, whereas about 4,000 tons were shipped in 1914. The tanning contents average 38 per cent.

Coffee is being experimented with in the districts of Manica and Chimoio, and already a few 3-year-old trees have produced heavy yields of berries. Samples of these sent to Lisbon and London were favorably reported upon, their flavor and appearance being described as excellent. Recently the government distributed more than 1,000 young plants among farmers, with instructions as to planting and care of trees. There is every indication that coffee can be successfully grown in this territory, and a good many farmers are already putting down small plantations.

Sisal seems to flourish at various places, but the only considerable area under cultivation (more than 1,000 acres) is at Villa Bocage, where the Zambezi Co. has installed a factory for the cleaning and preparation of the fiber. The fiber produced in the territory is claimed to be equal in strength, length, texture, and color to the best Mexican product, and in some cases it has brought higher prices.

Peanuts are largely grown by natives, who sell them to the agents of various local firms for export to Marseille. In pre-war times large quantities were shipped to Germany.

Samples of tobacco sent to the Transvaal have been pronounced satisfactory. The actual output is very small. The Sena Sugar Co., however, is said to contemplate the extensive cultivation of tobacco and cotton.

LIVE STOCK.

Portions of the territory are well adapted for cattle breeding, and in 1915 it had more than 100,000 head of cattle, of which about 8,000 of improved breeds were the property of the Mozambique Co. The number of cattle increased more than 25 per cent since 1913. The company, with the object of improving the quality, sells about 1,000 head of cattle every year. The East Coast fever has not yet appeared in the territory, but certain districts are infested with tsetse fly. The government assists farmers in the construction of dipping tanks by making advances and supplying material at actual cost.

FARM-MACHINERY TRADE.

There are no figures available showing the value of farm machinery and implements imported for use in the Mozambique Co.'s territory. As in the other sections of Portuguese East Africa, the imports of this class of goods are merged with those of other types of machinery.

Under the heading of industrial and agricultural machinery the following values have been imported from the United States in recent years: 1913, $215,482; 1914, $123,827; and 1915, $60,852. A conservative estimate would place the value of farm machinery at present imported at $100,000 per annum.

The importance of this market for American farm-machinery manufacturers must be viewed rather from the present indications of future development than the record of past importations of this class of goods. At the time of the writer's visit there, one of the leading men interested in the importation of farm machinery made the statement that as much machinery was then being sold to the farmers of that territory as was purchased by Rhodesian farmers. In the writer's opinion Beira at this time offers as good prospects for the sale of this class of goods as any other section of South Africa, and he firmly believes that unless some unforeseen condition arises the sections traversed by the Beira-Umtali Railway will witness a marked agricultural development in the next few years.

There is no difference between the type of implements used in the Mozambique Co.'s territory and those used in the rest of South Africa. Rhodesian methods, however, on account of the proximity to that country, exert a great deal of influence, and disk plows, consequently, are used in larger numbers than moldboard plows. Corn is the chief crop grown by individual farmers, and wherever oxen can be used American corn machinery should be actively in demand. Wherever the tsetse fly is still found, oxen-drawn implements can not be used, and in those sections a limited number of small tractors could undoubtedly be sold. In some parts of the country the work is done entirely by hand, natives being employed, because farmers with small means are not able to clear all their cultivated land of stumps when first starting operations. The success already attained by many farmers, however, should induce many new settlers with

adequate capital to engage in farming in the territory. A factor not to be overlooked in the future demand for implements is that whenever a new settler starts operations in the territory he requires a full set of implements.

The principal Rhodesian firms maintain branches at Beira, the only center of importance in the Mozambique Co.'s territory in connection with the sale of farm machinery. As the country develops, however, firms solely engaged in that territory's business are being established, which, even now, might be interested in making suitable connections with American manufacturers of farm machinery. Whenever Rhodesia is visited in the interest of manufacturers of this class of goods, the return trip to the Union of South Africa should by all means be made via Beira.

NYASSA CO.'S TERRITORY.

The Nyassa Co. administers the northern portion of Portuguese East Africa, its charter rights comprising about 75,000 square miles of territory, with its base at Porto Amelia, in which there are about 500 whites.

The imports into this territory amounted in 1914 to $607,138, the principal items being: Live oxen, $39,420; gold coin, $86,315; dyed, printed, gray, and bleached cotton, $193,031; food products, $12,684; and telegraphic material, $20,531. Many other articles in smaller quantities were imported. The imports from the United States amounted to $226.

The exports amounted to $248,419 and consisted of the following products: Crude wax, $78,350; peanuts, $57,633; Indian corn, $21,567; tobacco, $15,174; sesame seed, $23,723; and smaller quantities of crude rubber, raw tobacco, gum copal, and mangrove bark.

The country possesses potential agricultural possibilities, but (chiefly on account of its unhealthful climate) no efforts have so far been made to develop them along modern lines.

The imports of industrial and agricultural machinery amounted to $2,614, reflecting the exceedingly unimportant part that farm machinery plays at present in the development of its resources. The chief business of the company at this time is to supply native labor for the mines at Katanga, Belgian Kongo, and to the other sections of Portuguese East Africa.

IX. SOUTHWEST AFRICA.

This territory was known as German Southwest Africa prior to its occupation by the British army, from the Union of South Africa, during the present war. It has an area of 322,450 square miles and is bounded by the Kunene River, Portuguese West Africa, and Rhodesia on the north and east, and by the Orange River and Cape Province on the south. Swakopmund and Luderitzbucht are its seaports, although the natural port of the country is Walfish Bay, a British possession, a short distance south of Swakopmund. Its European population, according to the census of January 1, 1913, was 14,830, of whom 10,226 were Germans, including 3,522 civil and military government servants. The estimated native population is 80,000, excluding Ovampoland and Caprivizipfel, two regions remotely situated, which are inhabited by 200,000 natives. The comparatively small native population of the country explains its slow economic development, and it is also a reflection of the meager potentialities for development in comparison with the adjoining territories, particularly those situated to the south and east.

The Germans were in possession of Southwest Africa for some 30 years, and they spent large sums of money and much labor to make homes for their immigrants and to provide a market for German trade. They built railways, established townships, linked up widely scattered settlements, developed mineral resources, improved stock, sunk wells, and encouraged irrigation.

PHYSICAL FEATURES.

In the center of the country, from north to south, there is a long, broad mountain range forming a fine plateau, gently sloping to the north, as also toward the south, the height averaging between 3,000 and 4,000 feet, although in a few places it rises to 7,000 feet. Along the coast there is a strip of land from 25 to 100 miles wide that is nothing but a sandy desert and the most hopeless part of the country from either a pastoral or agricultural point of view. Its reclamation is much impeded by the shifting sand and, before the discovery of extensive diamond areas, that part of the country was entirely shunned by Europeans.

The sections between the coastal belt in the west and the Kalahari Desert in the east are, as a rule, fairly well covered with the varieties of bush and grass characteristic of the arid sections of South Africa, which in spite of their unpromising appearance are much valued for grazing purposes.

CLIMATE AND RAINFALL.

Summer in Southwest Africa lasts from October to March and winter from April to September. The climate in the central region is temperate and healthful, with a cool, dry, and generally pleasing

atmosphere. The fluctuations of the temperature are sometimes great. In the southern portions of Great Namaqualand it is intensely hot in the summer, though quite healthful for Europeans. Malaria in a mild form may be contracted in the subtropical north and northeast, and black water fever is not unknown in the north. Snow sometimes falls on the mountains in the coldest weather, and occasionally frost occurs on the uplands.

The northern regions around Grootfontein and Otavi have an annual rainfall of from 20 to 30 inches. In the Windhoek district toward the south, the rainfall is about 15 inches. Great Namaqualand in the south is much drier, having only 6 or 7 inches and very often much less than that. The Namib district, in the southwest, has about an inch of rainfall a year. As is the case in other parts of South Africa, the rainy season is confined to two or three months, and then the storms are often so violent that the water quickly runs off the baked soil into the watercourses. The rainy season is from December to March, although occasionally rain may fall at other times. Droughts of great severity and length are known in Great Namaqualand, and the northern and central regions also have had exceptionally dry periods. Generally speaking, where the rainfall is seemingly abundant the climate is somewhat unhealthful.

PRINCIPAL SETTLEMENTS.

The population is widely scattered, and at this time the principal European settlements are Swakopmund, Windhoek (the capital), Omaruru, Otavi, Rehoboth, Luderitzbucht, Keetmanshoop, Warmbad, Maltahoehe, Tsumeb, Grootfontein, Karibib, Okahandja, Gobabis, Usakos, Gibeon, Bethanien, and Waterberg.

FOREIGN TRADE.

The imports into and the exports from Southwest Africa, in recent years, have been as follows:

Years.	Imports.	Exports.
1897	$1,189,207	$393,606
1907	7,882,732	393,130
1910	10,790,072	8,441,275
1912	7,776,599	9,339,967
1913 (first 6 months)	4,477,112	6,993,715

The imports consist chiefly of foodstuffs, furniture, and other requisites for the white population, supplies for the government and its officials, railway material, and mining machinery. Minerals, chiefly diamonds, constitute about 98 per cent of the exports. Germany, before the war, had approximately 80 per cent of the total trade of the country.

If Southwest Africa remains under the control of the British Empire after the war, it will offer a fair opportunity for the sale of a variety of American goods. For some years to come, however, the white population will be chiefly composed of persons of German stock, who will undoubtedly show a preference, owing to custom and habit, for German goods.

MINING.

The diamond industry is the dominating factor in the trade of Southwest Africa. Without it the progress the country has made in the last few years would have been impossible. The output of diamonds in 1913 was valued at $14,000,000, more than double the output of 1911. Copper mining is also a rapidly growing industry. During the first half of 1913 copper was exported to the value of $759,690. Gold, silver, lead, and tin have also been found. Near the Otavi Railway, 109 miles from Swakopmund, valuable deposits of colored marble exist. Southwest Africa is reputed to possess some of the finest marble quarries in the world.

RAILWAYS.

In 1914 Southwest Africa had some 1,400 miles of railways. It is not improbable that it can show more extensive railway development in recent years than any other section of South Africa. Railway communication with the Union of South Africa via Prieska and Upington has been completed since the outbreak of the war. This railway was constructed as a military necessity, but it will doubtless become a permanent steel highway between the Union and Southwest Africa. It is not improbable that eventually most of the European traffic with the Transvaal will be handled via the ports in Southwest Africa, utilizing this railway; this would benefit the latter country in many ways.

AGRICULTURAL CONDITIONS AND PROSPECTS.

As a whole, nothing but pessimistic views have been expressed in regard to the agricultural future of Southwest Africa. This industry at present consists merely of garden culture, confined to small areas and nearly always assisted by irrigation. Since no rain falls for almost nine consecutive months, farming, as understood in the United States, is nonexistent. It is only on the alluvial land (flooded by the so-called rivers during the rainy season), where a little loose and fertile soil collects, that a number of small holdings are cultivated.

The rainfall is seldom sufficient, and the soil is rarely suitable for agriculture. In the southern and central parts of the country, out of an area of many thousand square miles only a very small proportion is arable land. Native labor is scarce and unreliable and the markets are very restricted. Although high prices are sometimes obtained for produce, they often do not compensate for the cost of cultivation, transport, irrigation, etc.

Considering the vast area of land that Southwest Africa comprises, the acreage under cultivation is astonishingly small. In 1915 there were about 1,300 farms occupying an area of approximately 35,000,000 acres, of which fewer than 15,000 acres were under tillage. Persons engaged in farming number 1,587 adults, or about 25 per cent of the civilian population. The district of Grootfontein contains about one-fourth of the cultivated land. The holdings average from 15 to 25 acres and are invariably under irrigation.

The principal crops grown are wheat, corn, Kafir corn, potatoes, tobacco, grapes, peas, beans, and onions. Alfalfa grows exceed-

ingly well under irrigation, and as many as 8 to 10 cuts a year have been averaged. Fruit growing has been attended with fairly satisfactory results, but so far it has hardly passed the experimental stage.

Much of the land of Southwest Africa is held by large land companies (the majority being German), which have made little or no effort, so far, to attract agricultural settlers. The principal land companies, with the number of square miles of land they own, are as follows: The German Colonial Co., 52,500; the Kaoko Land Co., 40,500; the Southwest Africa Co. (Ltd.), 5,000; the Otavi Mines & Railway Co., 1,000; the South African Territories (Ltd.), 4,650; and the Hanseatic Mining & Trading Co., 3,875.

Land can be bought from the government in blocks of 5,000 hectares (about 25,000 acres) at the following prices: Northern section, 1.20 marks (about 30 cents) per hectare (2.471 acres); southern section, 0.70 mark (about 20 cents) per hectare. Payment is made 10 per cent in cash and the remainder in installments of 10 per cent, free of interest. Occupation and cultivation are obligatory.

IRRIGATION POSSIBILITIES.

As a rule agricultural work can not be undertaken in Southwest Africa without resorting to irrigation. The outlook for extensive irrigation development, unfortunately, is not very encouraging. The few rivers intersecting the country are often useless for that purpose, since the overhanging banks of the surrounding plateaus often have a sheer rise of several hundred feet from the water. Fair supplies of water, however, may generally be tapped at moderate depths in most parts of the country, except for several miles along the entire coast. Almost everywhere in Southwest Africa part of the rain water sinks through clefts in the ground; part of it quickly evaporates and part collects in countless large and small beds, a great network of which intersects the greater part of the country.

Previous to the European war the German Government maintained two "boring columns," at an annual cost of about $200,000, which undertook all kinds of work connected with water supplies, besides boring tube wells. During 1913 about a dozen artesian wells were located and bored in the southern sections of the country.

There are a number of places where streams carry the rain water to the coast, passing through narrow passages between mountain rocks, and where there are exceptional opportunities for the construction of reservoirs for irrigation purposes. The development of four large projects of this kind, involving a total expenditure of about $2,500,000, which would facilitate the storage of 29,750 million gallons of water, were under consideration before the war. The execution of these projects would have the effect of bringing large areas of land under cultivation, the land adjacent to these proposed reservoirs being considered as among the most fertile in South Africa.

Until irrigation schemes are carried out it is certain that agriculture will play but a subordinate part in Southwest Africa. Crop growing may be a profitable auxiliary to stock farming in extremely favorable seasons, but the country will always remain preeminently suited for pastoral pursuits.

STOCK RAISING.

In connection with Southwest Africa as a stock-raising country, it is stated that the German Colonial Secretary, who visited the country a few years ago, declared that it was "a potential Argentina or Canada" and anticipated that the day would come when 3,000,000 cattle and 10,000,000 sheep would pasture upon its vast inland prairies. This is generally regarded as too optimistic a view of the pastoral possibilities of the country, although other investigators have confirmed the fact that it has a promising future in that connection. Certainly cattle grow big and strong and are extremely prolific. The chief value of the land lies in the fact that every blade of grass, leaf, or shoot possesses unusual nourishing properties. During the rainy season, for three or four months, the land is a picture of green vegetation and affords most excellent pasturage. Even after a long drought this retains its nourishing qualities and provides excellent feed for small stock. For the successful pastoral development of the country, however, the making and preservation of ensilage for winter feeding should be taken into account.

The area required for a stock farm is large, and a farm capable of giving a suitable return for labor and expenditure should be at least 20,000 to 30.000 acres in extent. A farm of 20,000 acres in Southwest Africa would carry from 400 to 500 head of cattle and a few hundred sheep.

When the war broke out the country was carrying the following stock: 205,000 cattle, 500,000 native sheep, 485,000 common goats, 55,000 woolen sheep, and a number of horses, mules, pigs, ostriches, etc. It is claimed that the increase of cattle in recent years has been at the rate of 70 per cent per year and of sheep 100 per cent and that three-fourths of the country's area is suitable for stock farming. The Liebig Co. has acquired a farm with a view to cattle farming on a large scale and with the ultimate purpose of establishing a factory for beef products. Meat and meat extracts promise to be the land industries that can be most successfully developed in Southwest Africa.

KARAKUL SHEEP—OSTRICHES.

The raising of Karakul sheep is proving a profitable industry. A stud farm has been established, and a number of pure and half-breed sheep of this type have been shipped to other parts of South Africa. Karakul sheep are said to be the hardiest sheep in South Africa. The sample skins of half-breed animals that have been sent to Europe have been highly commended. Ten dollars and even more has been paid for an exceptionally good lambskin, although the industry can be carried on at a profit if from $2.50 to $3.25 is realized per skin.

Ostriches do well in Southwest Africa. The breeding and rearing of these animals, it is hoped, will form a lucrative industry in the future.

MARKET FOR FARM MACHINERY AND IMPLEMENTS.

It will be obvious, in view of the information given concerning the agricultural prospects in Southwest Africa, that the demand for agricultural machinery and implements is exceedingly small. The writer did not visit Southwest Africa but made efforts to ascertain

the extent of the importation of this class of goods. With the exception of vague remarks to the effect that, since the majority of farmers in that country came from Germany, they use such machines as they were familiar with before going to Southwest Africa, and that occasionally a few walking plows and disk harrows have been imported from the United States, no information of a definite nature has been obtained. The fact that but 15,000 acres of land are under cultivation is sufficient indication that the demand is altogether unimportant.

Gen. Botha, the Premier of the Union of South Africa, has publicly stated his intention to encourage the settling of 10,000 white farmers in Southwest Africa. A good many farmers, who as soldiers went through the military campaign under his leadership, are known to have signified their desire and willingness to return to that country to take up farming as soon as its future political status is definitely decided upon at the termination of the present war.

With the exception of such land as may eventually be brought under irrigation, Southwest Africa is looked upon as a country in which the sole farming industry will be cattle and sheep raising. Incidentally, a certain demand for farm machinery may develop, owing to the belief that, in consequence of the frequently occurring droughts, the growing of ensilage crops would enable the farmers to withstand unfavorable grazing seasons.

Manufacturers of farm machinery and implements would hardly be justified at present (and the situation is not likely to alter in the near future) in making any efforts whatever to seek trade in that country other than by offering their goods to the various general merchants established there, by means of catalogues and correspondence.

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X. BELGIAN KONGO: KATANGA.

Since the district of Katanga, the southernmost section of the Belgian Kongo, receives its over-sea supplies and exports its produce via Beira, in Portuguese East Africa, and Port Elizabeth and Cape Town, in the Union of South Africa, and its trade, furthermore, is closely linked with that of other sections of South Africa, it is felt that information regarding its agricultural development and resources may appropriately be included in this report.

Katanga has become widely known in recent years because of its vast mineral resources, consisting of copper and other metals. Elizabethville, its capital, contains the largest white population (about 1,000) of any town in the Kongo. Railways connect Katanga with the neighboring countries to the south. The Cape-Cairo main line is its principal railway. Sakania is the station at the boundary of Northern Rhodesia and Katanga. The line at this time reaches as far north as Bukama, Belgian Kongo, about 400 miles north of Elizabethville. The construction of the railway from Kambove, in the Katanga district (the site of the Union Minière copper mine, which is said to be enormously rich and to stand in the midst of one of the most highly mineralized districts known), to Lobito Bay, in Portuguese West Africa, which will be 1,300 miles long, is being pressed forward and in possibly two years it should be completed. That railway will place the Katanga district several days nearer to Europe than the present routes via Cape or Portuguese East African ports.

The writer did not visit Katanga, but the agricultural future and outlook of that country can be intelligently estimated with the aid of the following statement from M. Edmond Leplae, Director-General of Agriculture:

OFFICIAL ENCOURAGEMENT AND AID FOR AGRICULTURE.

"The Belgian Government is keenly interested in the agriculture of Southern Katanga, whose climatic conditions are suitable for settlers. As almost no other part of the extensive Kongo colony is suited for Europeans, this is the Province likely to be reserved for white settlement later on.

"Only a small number of Belgian farmers arrived in this country before the war. The Pastorale Co. was started by private individuals to help the settlers, with the special approval of King Leopold. However, this company rapidly exhausted its capital in this very expensive country; so the Government organized an Agricultural Department, bought large supplies of machinery, steam plows, portable buildings, seeds, and cattle, made roads, etc., in order to assist the farming industry in getting quickly over the difficulties. In

this manner results were obtained in 4 years that could not have been realized elsewhere in less than 15 or 20 years.

"Henceforth only two experiment stations will be provided—first, the Munama farm, experimenting on crops and irrigation; second, the cattle-breeding station of Katentania, on the table-lands of Biano, 10 miles from Kansenia railway station. The cattle are divided among about a dozen substations, and number to-day 1,700 head; 200 or 300 sheep will shortly be brought on the farm. Great care is taken to guard the cattle against contagious disease. It is hoped that in five or six years it will be possible to admit private settlers on the table-lands, but we do not want to run risks, as Rhodesia was visited twice by diseases and lost thousands of cattle.

"It took us several years to acquire sufficient knowledge of climate and soil. Our agricultural meteorological station, the laboratory devoted to soil analysis, and the Munama experiment farm were of very great help in this research work. We understand now how to maintain the fertility of our soils—a very difficult problem. Irrigation has given fine results, as shown at Munama.

"Of the first settlers, many went home after a time or undertook some other work; but a few remained, and some new men joined them. There are now about 50 farmers in Katanga, the aggregate value of the crops grown this year on their farms being about $97,330. This is rather satisfactory, as four years ago this country was purely forest and bush, and is still full of tsetse fly.

"These farms, however, are only a beginning. After the war new settlers will probably be sent from Belgium, among them disabled soldiers or people that have been severely tried by the war. Nearly all the British colonies will provide for the settlement of a number of former soldiers on the land after the war; Belgium will probably do the same.

"The farms around Elizabethville are small, as good soils are to be found only in limited patches. More extensive farms are being cleared now in Kapiri, and some more are being prospected along the lower Lufira. As the tsetse fly is very common there, plowing will be done by steam traction engines. In order to assist the farmers, the repairing shed of Elizabethville will be moved to some site near Nguba, on the agricultural traction road running from the Lufira to Kapiri (100 miles).

"As His Excellency, the Vice Governor General, our Government's representative, follows every development of agriculture, the settlers should have no fear at all that their rights or interests will be forgotten.

DESIRABILITY OF COOPERATION.

"The settlers could derive much profit by starting a farmers' association, to buy and sell all products necessary for, or raised on, their farms, to handle the crops, build oil or flour mills, etc. The farmers' associations in Belgium have in 25 years made our Belgian farmers rich. They buy and sell everything that is needed or grown by the farmer; they own large mills, hundreds of steam dairies, mutual insurances of every description (fire, diseases of men and cattle, etc.), and hundreds of agricultural loan banks. The Boerenbond (Farmers' League) of Louvain has 50,000 members and handles yearly more

than $5,000,000. Its motto is: 'Help yourself.' This advice should be adhered to by the farmers in Katanga, as their Rhodesian brothers seem intent on pressing them hard with competition; association and official advice will enable them to stand the coming rush.

DEMAND FOR AGRICULTURAL PRODUCE.

"Some people, when hearing of new settlers arriving from Europe, seem to fear that overproduction will occur very soon if new farms are started. This is not to be feared for the present, as we import every year, via Sakania (Rhodesian border), about $500,000 worth of farm products and in addition we buy about $100,000 worth of produce grown by our local farmers and at least $100,000 worth of grain from natives. This means that we consume at present $700,000 worth of farm produce. Some of these products, such as cattle, milk, and butter, we will not be able to raise in sufficient quantities for many years. The approximate value of the produce at present imported, which we could successfully grow immediately, is as follows: Poultry, $5,500; eggs, $8,000; maize, $39,000; flour and meal, $60,000; fresh vegetables, $4,150; dry vegetables, $2,800; preserved vegetables, $6,500; coffee, $10,600; groundnuts, $7,300; and tobacco, $6,000. This shows that the farming production might be doubled immediately. It might be increased fourfold when cattle-breeding shall have made a good start. My conclusion is that our settlers need have no fear."

FARM-MACHINERY TRADE.

The preceding review indicates the present unimportant position of agriculture in Katanga. Conditions in that respect are quite similar to those prevailing in northern Rhodesia and the same crops are also grown.

The government of Katanga, it is understood, has imported direct the farm machinery and implements that it has required for its experiment stations and farms. The machines used by the farmers in that territory have, for the most part, been shipped there from Rhodesia or the Union of South Africa. Since oxen can not be used in some of the farming areas on account of the tsetse fly the number of implements shipped to the country is very small, as most of the agricultural work is done by the natives by hand. It would seem that, because of the presence of the tsetse fly, a limited number of small tractors suitable for general farming purposes (preferably those suited to operate corn cultivators), could be sold in the Katanga district.

XI. MAURITIUS.

Mauritius was not visited by the writer, but owing to the fact that that island can be best reached from Durban in 10 days or Beira in 6 days—two ports nearly always visited by representatives of American firms—it is felt that the following information concerning Mauritius will be of interest to American manufacturers of farm machinery and implements. Reports by American Consul James G. Carter, at Tamatave, Madagascar, and by the statistician and the director of agriculture of Mauritius have, in the main, supplied the data for this report.

The island of Mauritius is a British possession situated in the southern Indian Ocean, about 500 miles east of Madagascar and 2,189 miles from Durban. The area of the mainland is about 708 square miles and that of the small neighboring islets 4 square miles. Of the 382,714 inhabitants at the end of 1915, 261,093 were Indians, who make up the laboring element. The industrial activities of the colony are controlled by the Mauritian descendants of the former French and Dutch settlers and by Indian and British merchants. Most of the commerce is carried on at Port Louis, the capital and principal town on the northwestern coast, the population of which is about 42,000. Correspondence with Mauritian firms may be either in English or French. On December 31, 1915, there were 120 miles of railway and 432 miles of main public roads, owned and operated by the government.

FOREIGN TRADE.

The total foreign trade of Mauritius in 1915 was valued at $33,829,616, and it has shown a steady increase for many years. The imports in 1915 amounted to $15,591,840 and the exports to $18,237,776. Foodstuffs, chemicals, fertilizers, machinery, and wearing apparel are the principal articles imported. Sugar is practically the only product the country exports, as evidenced by the fact that sugar valued at $17,551,822 was exported in 1915.

The imports from the United States into Mauritius in 1915 were valued at $704,583, against $222,748 in 1914, an increase of $481,835. Machinery for mechanical transport valued at $122,131 was imported from the United States that year, against no imports of these goods in 1914. This material consisted of hoisting machinery for unloading sugar cane from tram and railway wagons, small cane carts, etc. Motor cars, salted meats, petroleum, tobacco, and timber are the other principal imports from the United States.

LAND UNDER CULTIVATION—CROPS GROWN.

Of the cultivated lands in 1915, amounting to 210,768 acres, 170,426 acres were devoted to sugar, 20,860 acres to aloe fiber, and 19,482 acres to food crops required by the European and Indian population,

such as vegetables, corn, manioc, tea, vanilla, coffee, fruits, etc. There is also a good production for local consumption of rum, vinegar, and butter and other dairy produce.

The soil of Mauritius is very fertile, and it is constantly improved by a good manuring system. The burying under of all cane trash is a regular practice. In some localities the land is exceedingly valuable, and as much as $1,000 has been paid for an acre of land.

SUGAR GROWING.

The sugar industry is the economic and commercial mainstay of Mauritius. The annual sugar crop averages about 250,000 tons of 2,240 pounds. That of 1915–16 was 217,000 tons, compared with about 270,000 tons for the period from August 1, 1914, to July 31, 1915. The 1916–17 crop was estimated, previous to a cyclone that visited Mauritius in May, 1916, at 280,000 tons. There are about 60 sugar factories connected with 150 or more sugar estates, whose cultivated areas average from about 100 to 2,500 acres. About two-thirds of the sugar factories average an output of 5,000 to 10,000 tons per annum, and about one-fourth of them more than 10,000 tons. The industry has made considerable progress during the past decade, the production for the year 1913–14 being nearly twice that for the year 1904–5.

Considering the area of Mauritius, it is obvious that the possibilities for the expansion of the industry are nearly exhausted. A careful survey to ascertain the possibility of further extending the sugar industry, made by the administration of the colony, discloses the fact that the country possesses only 55,000 acres more in which sugar might be grown. This land is inferior in quality to that now under cultivation and is relatively distant from the factories. If sugar prices remain steady, and labor is both plentiful and obtainable at a reasonable figure, it is not improbable that in the course of a few years these vacant lands will be planted with sugar and that about 310,000 tons of sugar will be produced annually.

METHODS OF SUGAR CULTIVATION.

The varieties of cane chiefly grown are White Tanna and several Demerara seedling canes. Uba cane is grown in lands of low fertility. As a rule canes are planted in holes, during December and January—two or three cane tops in each hole. Toward the end of April, holes are made around the plants and barnyard manure is applied at the rate of 20 to 30 tons per acre. The fields are continually kept clean by cultivation until the canes are full grown. The canes are generally trashed some time before cutting.

Cane is brought from the fields to the mills by means of tramway lines, traction engines, and ordinary carts. Until recently manual labor was employed to unload the cane into the cane carrier, but the mechanical loading of cane is making rapid progress since an American cane unloader proved very successful two or three years ago. The tramway system is rapidly expanding, since animals are subject to disease and therefore can not be depended upon for this work.

Most of the estates crush outside growers' cane in addition to their own, and some of them depend chiefly on growers' cane, the latter selling it at so much per 1,000 pounds.

LABOR.

Labor is comparatively cheap. The cultivation of sugar cane is mostly in the hands of Indians, indentured from India. These earn about 25 cents a day. Women also work in the sugar fields, cleaning the land and trashing cane, earning 15 to 20 cents in the inter-crop season and about 25 cents during the crop season. Of late years Indians have refused to renew their engagements, thus becoming free laborers, and since immigration has practically stopped owing to the Government's belief that there is an excess of population in the country, labor has gradually become dearer. This condition may bring in its wake the more extensive use of tillage machinery.

MARKET FOR FARM MACHINERY.

There has been a good deal of interest in agricultural machinery in Mauritius during the past few years. Customs returns indicate that during the year 1909 but two agricultural implements were imported. The number increased to 37 in 1912 and 259 in 1913, with 91 in 1914. The war probably caused the decline in the importations of 1914. The majority of implements now in use in Mauritius have been imported from the United States and consist of single-furrow plows, double moldboard plows, disk plows, harrows, and cultivators.

The area of land tilled with implements, during several recent years, is given as follows: 1909, about 6,000 acres; 1912, about 15,000 acres; and 1914, about 27,000 acres.

Plows are used in increasing numbers. A good many middlebreakers are used to open furrows, between the cane rows, in which to bury the cane trash. Where the soil is deep and without stones disk plows are increasing in favor. The drawback in extending the use of plows and cultivating machinery is that in a good many parts the soil contains numerous stones, in addition to being quite hilly.

The department of agriculture recommends the greater use of plowing and cultivating machinery as a means of effecting possible and necessary economies. It claims that considerable areas could be cultivated entirely with machinery. It was also suggested, some time ago, that inducements be offered to sugar growers to import tractors. Bonuses of $250 were proposed for the first tractor doing successful work in sugar plantations and for the first tractor to do so using industrial alcohol as fuel. The introduction of tractors is recommended because there is a shortage of pasturage in certain sugar estates, making it necessary to feed the oxen with expensive imported foods. There is also a shortage of good draft oxen, chiefly by reason of the fact that cattle diseases are prevalent in the country. The opinion has been expressed that tractors of from 12 to 15 drawbar horsepower would meet the average requirements.

After everything is considered the fact remains that the present demand for agricultural implements in Mauritius is very small and that the prospects, chiefly because of the small area of the country, are not such as to justify the hope of an important future demand for this class of goods. It might be well, however, to enter into correspondence with firms at Port Louis, offering such machines as may be suitable for sugar-cane growing and the soil conditions prevailing in that country, as a small demand for implements is likely to become permanently established.

○

MBABANE
Wakeley Point
Oro Point
Mapoy
Kosi Lake
Sambana
Sibai Lake
St. Lucia
Somkeli
Cape Vidal
St. Lucia Bay
Cape St. Lucia
Richards Bay
Lake
Zeleni
Pongola R.
Kosi
Ubombo
Ingwavuma
Ekulangeni
Vryheid
Newcastle
Utrecht
Wakkerstroom
Charlestown
Volksrust
Standerton
Greylingstad
Balfour
Bethal
Davel
Ermelo
Amsterdam
Bremersdorp
Umbolosi
Derby
Compies R.
Matva
Brereton
Pietretief
Rustfontein
Cornelia
Vrede
Quaggas Poort
Newmarket
Harrismith
Aberfeldy
Glencoe
Dundee
Feron Hoek
Fahlengeni
Somopo
Ladysmith
Pomeroy
Tugela R.
Umlatusi R.
Emmaus
Veenen
Eshowe
Estcourt
Grytown
Mooi River
Stanger
Lower Tugela
Weston
Lidgetton
Lions River
Impendhle
Pietermaritzburg
Camperdown
Edendale
Verulam
Durban
Bulwer
Richmond
Beersheba
Mafube
Matatiele
Sturrockstown
Umzimkulu
Clydesdale
Kokstad
Umkomanzi River
Umzinto
Harding
Bizana
Port Shepstone
Emtundiswehi
Emgodini
Umtamvuna
Port Grosvenor
Nomandi
Gordon B.
Old Buntingville
New Morley
Hotdale
Port St. Johns
Port Edward
Palmerton
Kamwenda
Kalaza
Antarsahr
Kafunka
Broken Hill
Nyama
Kasonsa
Sitanda
Mokoba
Karubue
Lucankas
Kowetu
Kalyangu
Nkala
Makanego
Nanzela
Meeba
Monze
Batokoe
Choma
Kalomo
Zimba
Makeli
Inkuka
Serais
Victoria Falls
Katoma
Malesi
Lukosi
Wankie
Thoma Mattsa
Tamazetze
Wacha
Kana Kana
Redbank
Bulawayo
Plumtree
Tuckeche
Khama's Country
Shashi-North
Bamangwato
Serule
Plts
Fort Tuli
Nyamandhlovu
Gwanda
Eagle
Nicholson
Magunje
Kraal
Matimpi
Matabi's
Mtibi
Tuli
Mesale
Chwala
Isiri
Kafunka
Kalaza
Antarsahr
Broken Hill
Nyama
Kasonsa
Sitanda
Mokoba
Karubue
Lucankas
Kowetu
Kalyangu
Nkala
Makanego
Nanzela
Meeba
Monze
Batokoe
Choma
Kalomo
Zimba
Makeli
Inkuka
Serais
Victoria Falls
Katoma
Malesi
Lukosi
Wankie
Thoma Mattsa
Tamazetze
Wacha
Kana Kana
Redbank
Bulawayo
Plumtree
Tuckeche
Khama's Country
Shashi-North
Bamangwato
Serule
Plts
Fort Tuli
Nyamandhlovu
Gwanda
Eagle
Nicholson
Magunje
Kraal
Matimpi
Matabi's
Mtibi
Tuli
Mesale
CONGO
KATANGA
KAFUE
NORTHERN RHODESIA
ZUMBO
Litela
Chasonga
Bemhwelo
Gaudota
Nhaukoe
Lomogundi
Chininga
Inchelia
Umvuma
Gwelo
Selukwe
Shangani
Gwaai
Bulalema
Bubi
Boomerang
Hanny
Bala Bala
Selingwe
Ndanga
Kultute
Umtubi
Sandava
Matiti
Sabi
Makuian
Matalea Vley
Shiamel
Mahunti
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Sunda
Ft. Jameson
Petauke
EAST LOANGWA
Mollio
Chimwala
Undi
Zombas
Chincoco
Sandia
Makanga
Recico
Mgenza
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Tsetsutsu
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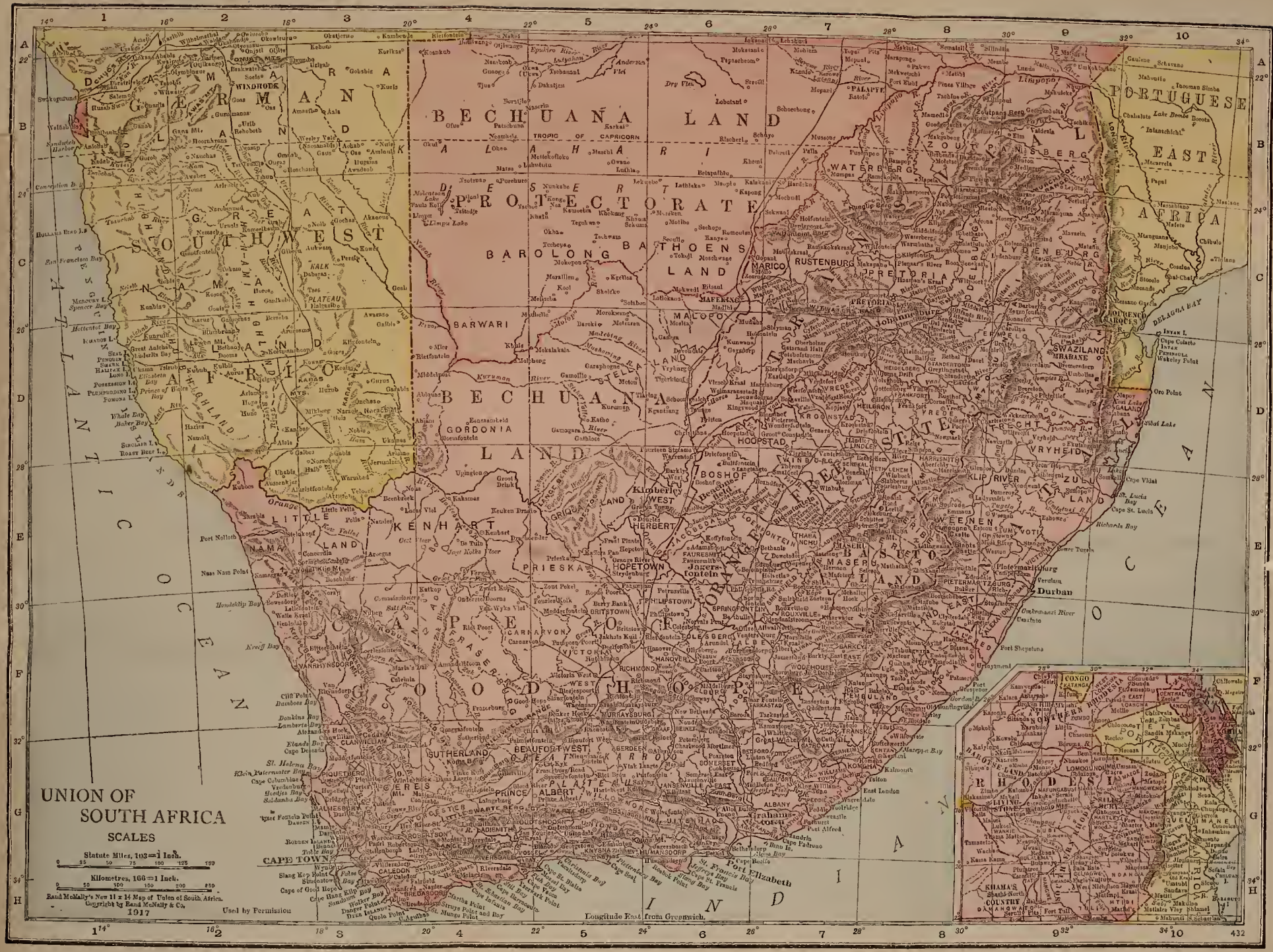
UNION OF SOUTH AFRICA
SCALES
Statute Miles, 103=1 Inch.
0 25 50 75 100 125 150
Kilometres, 166=1 Inch.
0 50 100 150 200 250
Rand McNally's New 11 x 14 Map of Union of South Africa.
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Longitude East from Greenwich
BECHUANALAND PROTECTORATE
BECHUANA LAND
GERMAN SOUTH WEST AFRICA
PORTUGUESE EAST AFRICA
SOUTHERN RHODESIA
NORTHERN RHODESIA
CAPE COLONY
ORANGE FREE STATE
TRANSVAAL
NATAL
BASUTOLAND
SWAZILAND
GORDONIA
KENHART
BAROLONG
BARWARI
MALOPO
THOENS LAND
MARICO
WATERBERG
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LYDENBURG
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Cape Town
Table Bay
Table Mt.
Robben Island
Hottentot Bay
Walfish Bay
Swakopmund
Walvis Bay
Angra Pequena
Port Nolloth
Namaqua Land
Great Namaqua Land
Little Namaqua Land
Great Karroo
Little Karroo
Great Fish R.
Great Kei R.
Orange R.
Vaal R.
Limpopo R.
Zambesi R.
Kunene R.
Okavango R.
Kalahari
Namib Desert
Drakensberg
Quathlamba Mts.
Lebombo Mts.
Matopo Hills
Victoria Falls
Kafue R.
Luangwa R.
Shire R.
Lake Nyasa
Lake Bangweolo
Lake Mweru
Lake Tanganyika
Lake Kariba
Lake Ngami
Lake Chrissie
Lake Sibaya
Lake St. Lucia
Delagoa Bay
Inhambane
Beira
Chinde
Quelimane
Mozambique
Lourenco Marques
Inyack
Chibuto
Manjacaze
Gazaland
Manicaland
Mashonaland
Matabeleland
Victoria
Salisbury
Bulawayo
Gwelo
Umtali
Fort Victoria
Fort Tuli
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